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THE WORKS OF ART AND BRIC-À-BRAC DOCTOR

A. BARTHELET

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Why ask for the moon
when we have the stars?

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INTRODUCTION.

We think we can safely say, that but few mortals can, without disguising their most faithful impressions, resist the desire to admire the numerous productions which of late years have been the result of decorative art! We seem possessed by an irresistible desire to secure some of the thousand and one so charming objects of ornament, which make our homes so attractive, and which we see exposed, with so much taste, in the shop windows on our most fashionable streets. Those innumerable works of art on wood, on glass, on bronze, on porcelain, ivory and other materials both natural and artificial, seem to have become, thanks to the refinement in our tastes and to the general improvement in our ideas, the indispensable companions of our most elegant residences. Nothing is more imposing, more elegant, more decorative, in fact more instructive, than a large collection of bric-a-brac, in which the forms are exquisite, classical and fantastic, reminding and at the same time representing to us nature's magnificence, the elevation of our sentiments, past history, and the grandeur of our attainments, etc., etc.

The rigid outlines and the simplicity of their design, the radiance of the colors, the reflection of the enamel and the profusion of precious metals with which they are decorated, all seem to make them assimilative to our tastes and to our most varied wants. The woman of the world, the enthusiastic amateur, even the scientific searcher, all have devoted some attention, some of their time and savings, to this most interesting study. Rejoicing as we do at the sight of our collections, the fruit often of much patient labor, and sometimes even of great pecuniary sacrifice, how very severe is our chagrin when, by carelessness or some accident, the hand of destruction upsets one or another of our precious works.

It is mainly to enable the amateur to himself repair in the best possible manner the unfortunate accidents occurring daily, that the author has undertaken to publish this modest work.

The growing interest in the study, as well as the collec-

tion of ceramic works, leads us to hope that this book will meet with a kind reception from the public, whose constant encouragement has so ably helped us whilst working, almost incessantly inspired by the idea of offering suggestions which will prove useful and practical to the amateur.

It is deeply to be regretted that workmen of established reputation—in fact, real artists—under the influence of ideas belonging to a former age, have thought it their duty to conceal the means by which they have attained their success and recognition. Not worthy of the gratitude of their colleagues, they have encouraged the many mediocre attempts of those who, having no other aim but that of gain, have left but too plainly the mark of their imbecility upon rare and valuable objects.

Not being a professional writer, and much less one "de race," we ask to be excused for the lack of attractiveness or the want of shape some parts of our work will present to the interested reader; but we have tried our best to make up for that deficiency by the close attention we have paid to every branch relating to this fascinating occupation. It has been our aim to generalize little facts that have been unnoticed, overlooked, or intentionally ignored by other essayists on the same subject; and should some of our readers not prove competent to accomplish much work by themselves, it will enable everyone to understand and to judge, no matter how dangerously injured are the sick, what will help them out best, and how competent or conscientious have been the "practical" doctors to whose care they have been intrusted.

Our own labors, practical experience, together with much valuable information gathered at home and abroad, both from books and intercourse with artists and critics, will justify our confidence in hoping for a favorable verdict of a public whose indulgence we earnestly solicit. To the intelligent man, the work of restoration becomes a very pleasant pastime and often quite a remunerative occupation. He needs neither the genius of the designer or painter, nor the talents of the sculptor, though practically he may borrow from these fine arts. Variety of resource is the root, ingenuity the trunk, and indefatigable perseverance the crowning glory.

A. BARTHELET.

THE

WORKS OF ART

AND

BRIC-À-BRAC DOCTOR.

BY A. BARTHELET,
Artist-Repairer of Fine Decorative Wares.

A THEORETICAL AND PRACTICAL EXPOSITION OF ALL THE PROCESSES EMPLOYED IN THE RESTORATION OF FINE ORNAMENTAL WARES. THE MOST COMPLETE WORK OF THE KIND YET PUBLISHED; THE ONLY ONE IN THE ENGLISH LANGUAGE; ACCOMPANIED BY "A HELP TO THE MEMORY," A HANDY LIST OF THE MOST FAMILIAR NAMES IN CONNECTION WITH CERAMICS, INDICATING THEIR SIGNIFICANCE, THE LOCATION OF THE FACTORIES, THE DATE OF THEIR ESTABLISHMENT, THE NATURE OF THEIR PRODUCTS, ETC.

Illustrated.

PHILADELPHIA:
PUBLISHED FOR THE AUTHOR,
830 NORTH TENTH ST.

NEW YORK; LONDON; PARIS.

1884.

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1884

AUTHOR'S NOTE.

THIS work, based on purely scientific principles, is entirely reliable; for it is an unrestricted account of what has been taught by a long practical experience, aided by diversified knowledge.

Distant amateurs, anxious to get advice or supplementary explanations, will find their letters welcomed and promptly answered; and parties applying personally will confer a special favor on

A. Barthelet

830 N. 10th St., PHILADELPHIA, PA.

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THE BRIC-A-BRAC DOCTOR.

I.—Cleaning the Pieces.

Before undertaking the description of our processes, we once more beg to solicit the closest attention from our readers. We shall try to repeat ourselves as little as possible, but we think proper to insist on the very punctual fulfilment of our directions. For instance, if we should say, Get your pieces cleaned; to many it would seem sufficient, indicating something they know *well enough* how to do; some even would feel quite offended at a recommendation we had *no need* to make. Still, practice showed us the importance of *little things*, and the reason why so many persons have failed in performing the *easiest* part of the work—the putting together of the broken parts. It was not so much on account of not having had the *best cement*, or lacking the necessary *patience;* but by not having brought in the cleaning part, the *nicety* therein required.

It is of great importance to have, as exactly as possible, all the pieces of the broken articles; therefore, at the time of the accident,

care should be taken to pick them all up, even the smallest ones, and to keep them in a box, the largest ones wrapped in soft paper, the repairing being the more difficult when the sharp edges have been destroyed by rubbing or *unnecessary* handling.

Not one piece of fine ware will ever be neatly joined together again, and consequently strongly fastened and likely to remain so, if the broken portions are not entirely freed from dust, bruised enamel, loose small chips, grease, or any foreign substance.

It is especially when it has been previously repaired that extra care should be bestowed upon it; the glue, cement, paint, etc., should be carefully scraped off, or better, dissolved by some one of the processes given hereafter.

Any piece of bisque, marble, china, glass and alabaster will always be benefited by a thorough cleansing, proceeding with caution should the article have been previously repaired; portions repaired not being supposed to stand soaking in water. The above substances can, in general, be subjected to the same treatment; except however, some kinds of fine elaborate pieces, such as separate flower bouquets, whose colors are mere spirit varnishes laid on, and for some other ornaments—glass for instance—whose gilding or silvering, for want of adhesive power, will stand but gentle treatment. White soap and cold water are first to be tried. With a

small wet brush or sponge take a quantity of soap brought to a froth; and, beginning at the top of the piece rub evenly all its parts, renewing the application of the soap and water until the former remains tolerably white, making use of a stick of soft wood or of a stiff and long-haired pencil for the deep cavities not reachable otherwise. Should some soiling not yield to the soap, as is the case with wax, old paint, varnishes, etc., touch these spots with concentrated lye dissolved in about fifty parts of boiling water, or with a strong solution of washing soda, using a little stick of soft wood, if necessary. In case some parts have been already repaired with putty—a substance, by the way, that gives the most unsightly results, that it would be preferable to do over—the said parts should be maintained for about 24 hours in a bath containing the strong proportion of potash described, occasionally helping the progress of disintegration by carefully passing a fine steel blade between the seams. Owing to the strong dissolving properties of potash, it will be well not to expose the hands in the liquid longer than absolutely required, washing them off after every contact with it; beware also of the wearing apparel. When the articles have to remain for some time in the liquid, none but vessels of china, glass, stoneware or pottery well enameled, should be used. The article being judged sufficiently clean, is well

rinsed out in several waters, and set on a folded towel or receptacle to drain its water, in a place free from dust; all the dampness or water remaining in the deep indentations being sponged out with small white rags. Alabaster and some kinds of marbles, being softened by water, will require handling accordingly. In cleaning pieces of these materials, rubbing all over is preferable to soaking, which most likely would affect the plaster with which these ornaments are generally put together.

In spite of the above treatment, should the piece present yet some foreign adhesive substances, these very likely are of the gummy or resinous kind. By exposing the parts before a bright fire, or above the chimney of a lamp, or better, at the flame of a spirit lamp, the substance will soften and can easily be rubbed off with a coarse piece of rag; then, passing over the place, while yet warm, another piece of rag wet with alcohol or spirits of turpentine, the piece will be found to have recovered its absolute cleanliness. Spots on hard and undecorated material, not enameled, can be removed by rubbing with a wet piece of pumice stone, or any fine sharpening water-stone. On enameled and decorated china or bisque ware, ink stains are removed with hydrochloric (muriatic) acid; and places that burned substances have blackened will be restored by using sul-

phuric acid; of course these latter substances should be employed only by careful persons, and the portions touched with them are to be rinsed out in water.

The treatment of the articles made of softer and more porous materials, such as plaster, clay, terra-cotta, earthen wares, etc., require closer attention; the salts of potash or soda remaining in the substance, especially under the glazing, being a great obstacle to the execution of the cementing, their affinity for water preventing the thorough drying of the glue, and the salts acting in different ways on the cements or colors employed in the completion of the work. It is evident that no strong potash or soda should be made use of for pieces of plaster, clay or terra-cotta painted in oil, nor soaking in water allowed, unless one's purpose is to remove entirely the said paint from the surface. As for the articles of the other class on which potash has been applied, it is necessary that, after having been treated as directed for china or bisque, they should be boiled in water a certain amount of time, or at least soaked in boiling water, in order to remove as much as possible of the salt contained therein. This being done they are set in a moderately warm oven until they are thoroughly dried. If, when taken out of the oven, some salty deposit appears at the broken edges, or through some imperfect part of the enamel, the soak-

ing in water should be done once more and the piece dried as before.

If not to be cemented together at once, the pieces are put in a box, or better, wrapped in separate papers.

II.—Fine and Coarse Work.

The work of repairing, in countries where it is extensively carried on, consists of two distinct sorts of occupations. The line drawn between them can easily be explained by the reason that some of these wares are acquired and kept as mere pieces of ornament, curious relics, or valued by us on account of the recollections their possession call forth; while others are intended for daily use.

In this book, particularly devoted to the collector's or amateur's use, we want, above all, to tell how to restore articles in the most perfect and unnoticeable way, regardless of the uses for which some of them have been intended. There only exists the genuine art, and the one who adopts it as his special calling is a *works-of-art restorer.*

Our readers will very soon understand, by the nature of the cement which an article will join with, what amount of external influence it will be likely to resist unimpaired. Amid the number of cement receipts we give in the following chapters, ample opportunity will be offered to choose one that

will answer the purpose, and combine as far as possible strength with good appearances. However, it should be remembered that articles repaired, on which missing parts had to be provided for, or on which paint, of whatever kind, has been applied, require judicious care if put into further use, referring specially to the bringing of them in close contact with water. They will always be more or less damaged, and their subsequent use is not to be attempted without risks.

The *china mender* differs from the former for the reason that his assistance is especially required for articles destined for constant use, such as dishes, pitchers, lids, flowerpots, fountains, garden seats and other articles of coarser description.

Strength and durability, united with cheapness of workmanship and promptness of execution, are sought for to the exclusion of any other consideration. His work is more of the mechanical kind, requiring but a few tools, and a very limited amount of knowledge.

The three substances he is especially acquainted with are plaster, gum shellac, and some kinds of white putty. The joining by means of clasps or rivets is his specialty, and very seldom does he pay attention to the *look* of his work. For want of training, which would little benefit his work, he seldom indulges in the use of colors, the more to his

credit, and the better for his customers' wares.

III.—A Cement not yet Discovered.

It is said of a German alchemist, the Baron de Botticher, living in the early part of the eighteenth century, that he was wise enough to abandon his fruitless investigations about the philosopher's stone (the great problem of that time), and to turn his attention towards the study and manufacture of china, with which his name is now so intimately and so eminently connected.

Some comparison could be established between this celebrated scientist and some of our modern inventors of china mucilage, with this difference, however, that they all claim to have succeeded (read their advertisements) in the discovery of a ceramic cement, their philosopher's stone, while, in fact, they do not evince much knowledge (see the nature of their compounds) about either the composition of china itself, or the nature of the ingredients they use, to back up the gross misrepresentation they impose upon the believers in their so-called discoveries.

So far as we have been able to ascertain by repeated trials on many samples, and however *improved* these glues may be, they seem to answer very poorly to stick fast either the china or the names of their authors in the annals of history.

To deserve the qualification of ceramic, a cement ought to possess very extraordinary qualities.

1st. It must be a mere liquid; for the solid particles it would contain, whatever the degree of their tenuity, and especially when a number of pieces are to be joined in a small space, would make volume and prevent the juxtaposition of the last pieces, thus forming a ridge at the edges of the articles, on its surface sometimes, showing a lack of continuity in the lines of the ornaments or design. It would be most objectionable to fine work.

2d. It must be colorless and not contain dangerous ingredients, neither acids nor alkalies, liable to alter the substances the article is destined to contain, or to be altered by them; among the latter being principally water, fruit acids, fatty or alkaline matters; to say nothing of the resistance to a *steady* temperature of at least that of boiling water.

3d. It must form no insoluble deposit, except such as can be easily removed by the use of chemicals of moderate cost, for, in case of failure in the first application of it, the article would be irremediably lost, especially if any quantity of it should spill or drop on the outer part of a fine and costly piece.

4th. It must not evaporate too quickly, nor take too long to dry; not be too thin nor too thick; be harmless to the operator, keep good, be handy, be cheap in price, etc., etc.

In short, to meet the requirements, it should possess all the remarkable resisting qualities of enamel, without requiring the great care and experience necessary for the preparation and application of the latter on pottery *not already cracked or broken.*

We shall always be found ready to help the searcher, for indeed we think the discovery worth while to be made. After having set forth the reasons why the numerous cement preparations fall short of their requirements, we hardly need to say that *one* cement cannot answer all the ends of the restorer.

If adhesive to a hard and unsoakable substance, as china, glass, or metal, surely it will not work in like manner on such all-absorbing materials as wood or plaster—a porous substance requiring a thicker glue than a nonporous one, thus offering more chances for a lasting piece of work.

Were we in possession of such an article, so much sought after—a stick-all-fast cement—how limited would be the use that could be made of it? It would certainly be the thing for a piece merely cracked, or whose parts are neatly broken, and but few in number. Unfortunately enough, hard bodies produce generally a great number of them, often too small to be advantageously utilized. Some of them, being bruised or lost, are to be provided for by artificial substances, which

themselves, in their turn, must be painted, decorated or glossed, to match the adjacent parts.

Therefore we ought not to be too much distressed and so particular about the perfectness of the cement, having happily, a number of handy substances that will answer our purpose, at least so far as our work is confined to purely ornamental wares.

IV.—Cementing Work.

Being ready to join together the pieces, we free them from dust, and, if operating on small ones, we spread them out on a piece of white paper and arrange them in their respective order. It is preferable to start with the larger ones; and, if parts of a piece that has a base, we begin with the pieces of that lower part. We will suppose it is a piece of china, for which we use the prepared glue. Before using any glue, we try the fitting of a few pieces, and having ascertained that they fit absolutely close, we spread over both edges a thin coat of cement by means of a small brush, following closely the progress of it so as to pick out any impurity it might leave behind in the glue, in spite of our efforts to have it perfectly clean. Without giving the cement time to dry or even to cool, we press them gently together,

watching the extremities, pressing gradually, until we are sure they fit well. This may be ascertained by the lines of the decoration and by passing the finger nail across the seam, holding both pieces vertically; no ridge should be felt if in their proper place; then they are left one side to dry partially.

The pot containing the glue should be kept in a warm place or deposited in a vessel containing some warm water; it must not be hot, but just warm enough to keep the glue in a liquid condition. The small pencil or brush is to be kept free from lumps, and the glue maintained in good liquid order by adding a little warm water when becoming evaporated. During cold weather the work should be done in a warm room, to avoid the glue getting chilled on application. Some persons heat the pieces or work at the side of a stove, so as to pass the pieces over it at the time of joining, sometimes using but a small spirit lamp. In adding the pieces, care should be taken not to leave any small china particles behind, for by trying to press them in afterwards, it would loosen the more important parts; also, not to spread the glue to the very end of the edges; for by being squeezed out it would form a lump at the angles and prevent the good setting of the subsequent pieces. Attention is to be paid to the order in which they ought to be placed, for some, by their peculiar shape,

would prevent the setting of the following ones. Having put together a few, we give them time to dry partially, say fifteen minutes. If it is a flat piece, we lay it vertically in a secure position; if, on the contrary, deep, round, oval or square, we tie a string several times around it. Then we proceed to the remaining parts, making use again of glue, but after being well aware how the pieces fit in their dry state.

When the whole is united together, the article is left to dry for 24 hours; after that time the glue squeezed from the joined parts is scraped off with a penknife, and, in order not to leave the least amount of it along the seams, a clean white rag, just moist with water, is passed over them, lengthwise. Being set aside a couple of hours more, the piece is ready for the filling up. (See Chapter XVI.)

V.—Different Cements—Prepared Glue.

Of all the cements that are compounded, glue is still the most serviceable and the most universally employed. The facility of its preparation, its liquidity, transparency, its adhesiveness to almost any substance, the readiness with which it works at almost ordinary temperature, are so many reasons that entitle it to that preference. It answers equally well for porcelain, bisque, marble, glass and wood; for this latter, however, it is

preferable to make it somewhat thicker and to use it as warm as possible.

To prepare it: Get glue of the best quality, and as colorless as possible, and an equal quantity of white gelatine; put these in a vase of cold water to swell up for 24 hours; then, pouring out the water not absorbed, let the remaining glue boil for two hours in a water bath; it will become clear and will acquire the proper consistency. In this condition the glue would have the inconvenience of drying too quickly by contact with the air, and its adhesion to smooth surfaces would not last long. To delay the drying of it, a little glycerine is added (one hundredth part); and in order to prevent the glue from getting mouldy, so as to spoil, a little carbolic acid is added, say two drops of acid to the ounce of liquid glue, thoroughly mixed with it before it becomes hardened by cooling.

Acetic acid can be used instead of carbolic acid; in that case twenty drops of acid to the fluid ounce will answer the purpose. It will be remarked that the action of the acetic acid on the glue renders the latter more soluble. If five ounces of dry glue are dissolved in six ounces of pure acetic acid, by stirring well or using gentle heat; and if, the solution being effected, we add to it three ounces of glycerine, we shall obtain one of the strongest mixtures that can be manufactured

with glue. It is an article somewhat of that composition that has been so extensively advertised as "London Stratena."

But practice has shown us the little benefit to be derived from such compounds; not only is it too viscous and not more water-proof than any other glue of mere water vehicle, but we have found the strong acid very objectionable in our special way of dealing with fine work; besides, the large quantity of glycerine contained therein not only counteracts the power of the glue itself, but prevents the whole from drying within a reasonable amount of time.

A few persons have thought that the mixture with ordinary glue, of oils, balsams, and rosin even, would render the cement water-proof to some extent. The least application of warm water to the articles joined with those emulsions shows the ridiculousness of the assumption. The addition of these substances only adds to the thickness and opacity of the cement, at the very great expense of its adhesive qualities. Theory and practice amply demonstrate the inefficacy of the admixture; it is much more rational to cover the cemented seams with a coat of some substantial varnish.

VI.—Silicate of Potash.

Here is another substance which has been sold and represented as possessing

water-proof qualities; indeed, great has been our surprise to see it exclusively recommended by a certain otherwise noted author of a book on repairs. We have given it a fair trial, but have not found in it any of the special properties warranting such a strong endorsement.

On the contrary, we feel very much inclined to discourage its use. It might be said that silicate of potash adheres very strongly and permanently to glass, porcelain, stone-ware, marble, even to metals; in fact, to any nonporous substance; that it will stand dry heat, even to the red-heat point, and that its adhesiveness on glass is remarkable; but, very unfortunately, when exposed to dampness, the pieces so joined fall apart most easily, owing to the strong proportion of potash it contains, whose affinity for water is known to all. When laid on a porous substance, it is as readily absorbed by it as mere water, leaving nothing or nearly nothing at the surface. In order to remedy this last defect, some persons have mixed with it some insoluble powder, such as plaster, baryta, ground glass, whiting, etc. This renders it still more objectionable, as we have explained already, in the previous chapter, how these coarse powders by their presence prevent the necessary close union of the pieces. These are the special reasons why we condemn its use: 1st. The silicate

of potash (or of soda) dries instantly by exposure to the air, and forms at once a crystalline pellicle that must be broken or bruised to allow the pressing close of the corresponding piece. The quickness with which it must be handled gives at best but a very doubtful result. It cannot be used on large surfaces on account of affording no time for the wetting of the edges with it, for it is absolutely necessary to spread the the silicate on both of them. 2d. Its action on enamel or glass is very corrosive, and if the seams are not scrupulously cleaned at once, which is most unhandy, it will helplessly corrode the outside surface of the article. Should the first attempt not be successful, it leaves a deposit of silice in the grain that is most difficult to remove sufficiently for a subsequent repairing. 3d. When the silicate is mixed with powder it produces a paste that will harden extremely at the surface, but whose under portions will remain in a soft condition, for need of the necessary air to harden, as would any liquid in a tightly corked bottle. On porous substances it is almost impossible to make any use of the mixture, and, we repeat, it is only on glass or on wares of coarse description that the liquid silicate should be used, with the greatest possible neatness, care and speediness. A specialty has been made of the mixture, which is found on the market put

up in twin bottles; in one is the silicate, the other contains the powder—baryta or white marble dust. The best powder to be mixed with it would be ground glass.

VII.—Gum Arabic or Acacia.

By no means can a mere solution of gum acacia be made to adhere any length of time and hold together pieces of china or glass; but if not good for cementing, the product is very useful in the repairer's hands.

When mixed in proper proportions with some whiting it will make a good paste to fill up the small spaces or holes left between the joined parts of an article; and, according to the proportion of gum employed, the paste can be made to acquire different degrees of toughness.

Plaster soaked with its solution will harden considerably and will receive more evenly the paints that are intended to be put on it. It will hold in suspension powdered colors, and is the best recipient for them when applied on bisque, clay, wood, satin, etc., not to mention its extensive use for gold-leaf work. A little quantity of it in the water used in mixing plaster will retard the settling and render it more manageable.

VIII.—Gum Adragant.

This white substance, somewhat trans-

parent and which possesses qualities very similar to those of the gum acacia, seems to have escaped the notice of the restorer, and we think we are the first to mention it; it is, nevertheless, susceptible of rendering good service.

Boiling water hardly acts upon it, but, if exposed in cold water for twelve hours, it absorbs it, and swells up to such an extent that an ounce of the gum will furnish a quart (litre) of very thick mucilage.

It differs from the gum arabic by not dissolving in water, but merely dividing in it. With it we have composed a mixture, possessing very lasting properties, and remarkably good for clay or plaster ornaments; entirely liquid, it affords a perfect joint, and pieces mended with it cannot separate at the same point. It will not peal off as other water cements invariably will, and does away with the process of repairing plaster or clay with plaster, heretofore generally adopted, though most objectionable to elaborate work.

To prepare it: 1st. Powdered gum adragant, 1; glue cement, 20; mix well in a mortar. 2d. Dextrine, 3; water, 20; mix and boil five minutes.

Put the two in a wide-mouthed vial, and add: Glycerine, carbolic acid, of each five drops: cork well and shake the whole briskly.

IX.—Gum Shellac.

This gum is found at the druggists in small thin sheets of yellowish-brown tinge, more or less colored and semitransparent. Soluble only in strong alcohol or ether, merely softened by boiling water, it remains unaffected by cold water, and is beyond doubt the best known natural and waterproof sticking substance obtainable by the restorer.

Its adhesiveness on porcelain, bisque, parian marble, clay, marble, metals and glass, is perfect.

It is applied on the goods in a dry state, melting at the contact of the broken edges of the pieces, which must be heated to a point above that of boiling water. It must be said, however, that owing to the heat to which the pieces ought to be subjected, it becomes quite difficult to make use of it when a great number of pieces are to be joined together; the heat communicated to the surrounding parts softening the whole work, and rendering it entirely unmanageable.

Its natural color also makes it objectionable to undecorated wares, or to those whose tints are light and uniform; but as we indicate a way to conceal the repairing by the restoration of the original colors on the article, that objection will yield to the superior advantages it possesses over all other cements, whenever strength and lasting

qualities are specially in view. As it would be unhandy to make use of the shellac as found in the trade, it is preferable to shape it into sticks; this is done by melting it in a pot or tin can exposed to the water-bath, stirring well until in one mass; then, pouring the gum into lukewarm water, it can be easily worked, pulling and rolling it into sticks of the desired size.

When employed for marble or deeply colored glass, a very small quantity of coloring powder will give it the approximate color of the article to be joined.

Some practitioners mix with the shellac some sulphur; it would certainly be difficult to explain the advantage derived from such an addition. Sulphur, being softer, and more brittle than the gum, cannot add any valuable property, for it does not dissolve but merely divides in it; when strongly heated the mixture separates and allows the melted parts of sulphur to float about as would drops of grease on gravy. The sulphur is not beneficial, but is certainly injurious; for with it the shellac is most easily burned and utterly spoiled by the least contact with the flame of the heating apparatus. Sulphur should not be thought of for clean work on white or slightly colored wares; but the habit of following examples set or doing as told to do, without further inquiring, is in man's nature, so it is not strange to have to

expose the many oddities connected with a most complicated branch of work.

It will be well to remember that the white shellac of the trade is none other than the ordinary brown shellac boiled in some alkaline water until quite bleached; but, as it cannot be caused to melt without recovering its original color, it is much more rational to use the plain article. To soften the shellac it will suffice to mix with it, while hot, from one-twentieth to a tenth of Canada or turpentine balsam. Sometimes, prepared sticks are sold under the above name, which are only a mixture of gum mastic, and turpentine balsam (one-tenth), to give the former some consistency. We have found that mixture entirely too soft, and cannot recommend it for ceramics; another objection is, that the spirits of turpentine of the paint finally employed, will dissolve or will soften it considerably more.

If uniting pieces presenting large surfaces, or fastening upon the ornaments some metal mountings, the softened gum, melting more readily, is much preferable, the article thereby not being exposed to any unnecessary risk. All wares are not to be indifferently subjected to the same treatment, especially in the dry condition, which allows the reaching of the red heat point; due consideration is to be paid to their conductibility.

The plaster will not stand the necessary

heat required for shellac melting, while the baked clay stands it but a very short time; marble, china, or bisque might support it well enough in a thick part, but will invariably peal off or crack open, if a strong blaze is directed to a thin portion of the same article. But of all the materials the restorer becomes acquainted with, none is more difficult to handle than glass; experienced hands, even, not being always successful at a second application of heat to that substance.

Whenever heat is to be applied to a piece of pottery, we advise to communicate to the surrounding parts a little of the heat which is to be concentrated on a given point. Particularly for glass, extra care is to be taken. The article should be kept over the lamp in constant motion, giving, however, the part to be cemented a little more time to be heated sufficiently, but making the whole partake of the heat applied.

Of course, we do not recommend such cementing for fine pieces, kept as mere specimens, or for keepsakes; for those, glue is certainly the best. But, with judicious care, quite a number of costly glass ornaments can be permanently fixed up, and many other valuable pieces for the table can be restored for daily use. Gradual exposure to the heat of an ordinary oven is all that is required for large pieces of heavy glass. Though any smokeless flame is good for shellac melting,

we use by preference an alcohol lamp, provided with a long tube for the wick, and fixed so as to reduce the flame when operating on minute pieces; for extensive work, pyrolignic acid or wood alcohol is preferable, costing but one-third as much as the rectified liquid. To cement, we begin with the broken-off pieces. We take one of them, holding it by one end of the broken edge above the flame, in a vertical position, so as to preserve the corner we hold by and also not to get the piece unnecessarily hot all over, which would delay the work considerably and scorch the fingers. Avoid red heat. The edge is sufficiently hot when the mere contact of the stick with it causes the gum to melt gently, without bubbling.

Having started with one end, we coat carefully and moderately with the shellac, proceeding by small portions in order to have the edges well covered. Lay that piece aside and attend to the others, taking several of them. When too small to be held by the fingers, a pair of tweezers is necessary. If when working on earthen-ware or clay, we notice that the shellac boils, runs, and does not adhere, it is an indication that the piece is greasy or has been improperly dried. This must be remedied at once.

Taking (one in each hand) two corresponding loose pieces, we pass their edges over the lamp, lengthwise, at the same time,

allowing an upward direction to the flame; and, as soon as the cement is remelted, we press them gently and evenly together, keeping the seam hot until a perfect joint is effected. We hold tight for one minute, or more if the pieces are very thick, to give the cement time to harden a little by cooling off; and, before it hardens too much, we scrape off with a sharp knife the superfluous cement, so as to examine the condition of the joint.

To these we add the others (if any), and manage the work so as to obtain but a continuous line when ready to join them to the main part of the article. The particles of gum remaining on the surface are removed by the aid of the knife, the sand-paper, and finally by the use of a clean rag just moist with alcohol. This cement requires no drying and, notwithstanding the long explanation we have indulged in, takes very little time and intelligence to produce a most substantial job.

The pure gum shellac is especially precious when dealing with pieces of small size, which, by their form and size, are more liable to meet with accidents; such as handles of vases or cups, raised ornaments, knobs of covers, feet of vases, etc., having but a little surface to be attached to.

It is the only substance likely to hold at the edge of chipped off articles, such as plaques, rims of vases, or sharp-angled orna-

ments. With it we can supply those minute pieces lost at the time of the accident, and that a careless broom has conveyed to the dust-pan; among which are small flowers, stems, leaves, little fingers, etc. It will fill up little holes in a defective cup, vase, or pitcher that leaks, and make stronger than before a new and costly ornament, badly cracked or split open in some of its parts during the baking process, and that we would not have been able to purchase but for the large discount made on its price; such imperfect pieces being termed in the trade as "seconds" or "thirds."

To fill up cracks and strengthen bent-open parts, it is only necessary to heat properly the place, and by rubbing steadily over the crack with a very thin stick of shellac, cause some of it to melt, penetrate, and fill up the open space. While still warm, cut level the cement, then smooth down with fine sand-paper, and clean with alcohol. This is the way to restore very unsound wares.

X.—Liquid Gum Shellac.

It sometimes happens that we have to repair very large pieces of terra-cotta, stone-ware, clay work, marble statuary, or earthen-ware, which, on account of their size and thickness, cannot be fastened by the melting process. In that case we have recourse to a thick solution of the gum

in strong alcohol (gum 1, alcohol 3), to which a little ether, about one-tenth, is added to produce the evaporation. Should we have on hand some ordinary shellac varnish, we allow some to partially evaporate in a saucer, stirring occasionally; and the mere addition of ether or chloroform is then required. This cement is to be kept in a glass-stoppered vial, and the work must be promptly executed.

By the way, we might mention that such coarse work is also successfully performed by coating both edges of the pieces with litharged linseed oil, commonly called dryer; when partially dried, another coating is given, and the pieces are to be tightly held together, making use of a weight, rope, or sometimes a little wedge at a certain point under the rope, for round pieces especially. Pieces mended by either of these two processes can stand out-door exposure.

XI.—Chinese Cement.

The name of this cement is familiar enough to the ear of any of our readers, and its qualification forcibly conveys the idea of something unusually strange about its composition and virtues. Quite anxious to know about it, we have inquired and have been told of as many different receipts for it as we have met with receipt-tellers. We have come to the conclusion that either the genuine

receipt has not been made public, or that the Chinese cement is not preferable to the prepared glue. Of course, we are generally opposed to any containing solid matters; and the receipts given us, and the several specialties labelled with such a name, can be included in this plain formula: some white of egg, dried or fresh, mixed into a paste with lime, egg-shell, or finely powdered glass. By mixing any fine insoluble powder with the mucilage produced from gum adragant, we have obtained a paste that compares favorably with any examined by us.

XII.—Putty Mending.

We shall not despise the old and venerable putty, that has rendered our ancestors so many signal services, because it is an affair of the past. On the contrary, we shall humbly admit that for articles subjected to rough and daily use, as kitchen, table, or toilet-wares are, no more reliable cement has been found, or is likely to be found; for the longer it is exposed to changes from hot water to cold, and vice versa, the more it hardens, the better it resists, and with the assistance of clasps or rivets, intelligently set in, an article can be used with as much impunity as if never broken before. The oily compound cannot be improved, and the fineness of the powder that forms its bulk is the only thing to be observed. It must be said, for

the sake of parties desirous to make use of it, that the putty must be expressly made for mending; it must contain nothing else but boiled linseed oil and white lead in powder, though a little of ground litharge will help the hardening much. Very unfortunately, it must be made quite thick to be good, and when applied on porous bodies, the oil, separating from the powder, leaves all around an indelible soiling; and of the former putty there remains only a useless, crumbling amalgam. We need not speak about the time it takes to harden nor the most unsightly appearance it gives the pieces so treated.

XIII.—Fish Glue.

In many instances we have seen described the process for dissolving this substance, which also bears the name of Ichthyocolla, or Isinglass. It is said that it dissolves in water, and is to be treated as ordinary glue; but this work, not being a mere compilation of receipts picked up here and there, but the production of our painstaking knowledge, we did not want to save our time (called money by some) and through carelessness cause others to lose theirs, and to censure us for their deception. Being aware that there exist two different sorts of this glue, the Russian kind, white, translucent, and in thick sheets of about the size of the hand, and the other, of American manufacture,

cheaper and more generally known, presenting a dirty-looking yellow substance thinned out in sheets, resembling ruffled straw paper —we have provided ourselves with the second kind, the one more readily found at home. We have soaked some in water for 24 hours, then have boiled it for two hours, stirring all the time, and to the best of our knowledge, but have been able to dissolve but a very trifling portion of it, the glue being merely divided in the liquid. The way to prepare it is to keep it for 24 hours in a water-bath, stirring occasionally; the glue will dissolve more readily in warm water if it has been previously soaked with alcohol, but is too dark in color unless prepared with the Russian species, which is quite expensive; and not offering any advantage, we cannot patronize its use. Several cements have been compounded, of which isinglass is the chief agent and ingredient, which are known as Universal Cement, Diamond Cement, etc., but as alcohol, gum mastic, salt of ammonia, and other ingredients enter into their composition, we are at a loss to imagine where the strength of such mixtures can be. They are most unhandy to work with, and do not keep well. The amount of repairing we do over every day tells us how well they work, and how good cements generally are. This is said to warn our readers against the danger of taking for granted facts and receipts occasionally

published in so-called scientific papers, often accompanied by bold and groundless assertions.

XIV.—Ivory, Shell, Vulcanite, etc.

Most of the glue compounds will work very poorly on these substances, owing to the greasy nature of the ivory or bone and the peculiar composition of shell or artificial product. The surfaces must be well cleansed and touched up with some alkaline water; spirits of ammonia (hartshorn) is preferable. The prepared glue or arabic mucilage must be well divided in some fine powder, for the watery liquid is but partially absorbed. We have found that a paste made of carbonate of ammonia and weak glue will answer as well as anything else. In case some elaborate pieces cannot be managed so as to offer a proper fitting, a melting paste should be used possessing sufficient lasting and adhesive qualities. We think that one made with rosin three parts, plaster, whiting or coloring matter one part, will be found to answer well.

XV.—Some Odd Compounds.

The following are several receipts of odd kinds of cements or mastics which differ entirely from those usually published. They have been extensively tried and pronounced good; but, on account of their composition

they will apply only to a very limited number of cases, especially of work of the coarsest description:

1. Curdled milk, white of eggs, equal parts. Beat the eggs in the milk and add a sufficient quantity of quick lime to form a paste. Will stand water and heat.

2. Sulphur 3, powdered graphite 2; to be prepared by fusion.

3. Fine iron filings 4, garlic 2, acetic acid 1; bruise in an iron mortar, the well-decorticated garlic with the iron; when reduced to paste add the acetic acid and make use of it at once. It is unsurpassed for plugging iron into stone.

4. Fresh sheep's blood 2, quick lime 2, melted tallow 1; slack the lime into the blood; when in paste, stir in well the tallow previously melted. To join heavy stones.

5. Pulverized baked bricks, quick lime, wood ashes, equal parts, well mixed, and formed into paste with olive oil; it hardens promptly and does not break under water.

6. For small repairs on articles made of hard wood or marble, use a mixture of rosin 2, common wax 1, colored to the shade of the wood or marble. Often preferable to glue.

7. Cement for very large pieces of porcelain or stone-ware: dry white river sand 20, pulverized litharge 1, quick lime 1, boiled linseed oil, sufficient quantity for a handy paste.

XVI.—Filling up Small Openings.

It is very seldom that a piece breaks so neatly that the cementing alone is enough to restore it to its former appearance; the small openings left must be filled up very carefully, for the painting finish of the work would suffer very much if this was not attended to very nicely. The paste is made of whiting and nitrate of baryta in equal parts, and a weak solution of gum arabic, though glue or desk mucilage will answer very well. Half an ounce of gum will suffice for a large tumblerful of water; the mixture is prepared on a slab and thoroughly mixed by means of a wide knife's blade or palette knife. A little experience will tell better than exact weights the proper proportions of the two substances employed. The paste should be of the consistency of very thick putty, and when worked with the spatula it should not pull or be too glossy in appearance. If made too thick, it will not fill up well and dry too quickly; if too liquid it will contract and will crumble. When the mucilage or glue is too strong the paste will harden so much that it will resist the cutting, and will polish under the sand-paper. The paste dried up on the slab loses none of its properties, a few drops of water rendering it fit for use at any time. We recommend to have the seams well freed from glue or

cement lumps, for these would swell at the contact of the damp paste and consequently throw the latter off. If the filling up is to be done on soft material, a little soaking of the clay with diluted gum arabic, glue, or gelatine, or better, colorless spirit varnish, is very useful, not to say necessary.

The paste having been pressed into the seams with a curved blade or very small trowel, is left rising a little above the surface. After a twelve hours' drying fine sand-paper is employed to grind off the paste to a level. Then paper of the finest grain (No. 00) is carefully passed over, so as to obtain a perfectly smooth surface. Feeling with the finger across the seam should detect no raise or cavity, if the work is well done.

We have found it preferable to prepare our own whiting. Dividing the lumps in plenty of water and stirring well, we skim off the floating dirt, and allowing half a minute for the sand or heavy substance to settle at the bottom, we pour the liquid into another jar, where the water deposits the fine, clean and uniform powder.

On such semi-transparent wares as alabaster, marble, colored glass and ivory, it is sometimes preferable to make use of wax, plain or hardened with rosin (one-fourth), and, if necessary, colored with powdered colors, so as to match the tint of the object. A similar mixture can even be made use of

for pieces of thin china, or Parian marble, preferably to anything else; but we think that the general adoption of this process ought to be condemned, for there is a very limited number of cases where it is susceptible of giving satisfaction. Practically, the exact coloring of the wax, and its application and handling, are matters of the greatest difficulty. Besides the fact that it is entirely too soft, for the least heat or pressure of the fingers will deform the work so executed, wax cannot either stand painting over or varnishing of any kind.

If the article intended to be repaired has previously been subjected to wax treatment, it should be very carefully cleaned, for the wax, most readily conveyed to the broken edges, would interfere with the work of the glue or cement.

XVII.—Supplying Larger Pieces.

Plaster is the most handy substance to make large pieces with. It will harden uniformily in a very short time, is easily cut or carved, and will keep in its shape. It fills very perfectly all the minutest parts wherever applied, adheres to almost any kind of material, and receives equally well colors mixed in either water, oil, or varnish. A distinction should be made between the two sorts of pieces to be provided for. When the space is entirely surrounded by the firm por-

tions of the article, it is a mere filling up; when, on the contrary, the pieces to be made, by their shape or exposure, are more liable to be handled or broken off; as for instance, the edge of a plaque, the knob of a cover, the foot of a vase; these should be strengthened by one or several pieces of wire. The extremities of these wire pieces are inserted into the thickness of the substance of the article by means of little holes, drilled by the processes described hereafter (see Chapter XVIII.), or are simply bent so as to follow the edges of the broken parts, and sealed fast with shellac, (see Cut No. 1.) When the thickness or friability allows it, the wire is set in small incisions or grooves, or is dispensed with entirely.

Therefore, if we have to provide for an exposed piece, we prepare a frame by taking a piece of soft iron wire, being in size but one-third of the thickness of the surrounding edges, and, having flattened it moderately, we bend it into the shape the piece is to be made, taking care to have it so that the plaster will hide it entirely. When the piece is to occupy the outer edge of an article, the wire should be placed as close to the rim as possible, and if of very large dimensions, several wires are required. When drilled holes are necessary, the thickness of the article will indicate their depth, and hence the extra length to be given to the wire; for

china or earthen-ware, from one-sixteenth to the eighth of an inch is all that is necessary. Giving a sharp bend at the middle of the shaped wire and straightening it out again, we insert it into the prepared holes and seal it in them with shellac or a little filling paste, or by pressing in little bits of metal. For handles, spouts, or knobs, the holes should be deeper, sometimes drilled through, and the wire stronger. (See Figs. 1 to 7, p. 45.)

The frame being affixed, and, if necessary, the clay being soaked as directed in the preceding chapter, we take a piece of modelling wax, worked and softened by the fingers, and reduce it to a thin sheet and form with it a kind of partition that will serve to receive and hold the plaster. Careful operators employ only a piece of pasteboard or Bristol card covered with a thin piece of paper, leaving only the paper attached to the plaster as soon as it settles, for the dampness would cause the card to bend inwardly. A quantity of plaster being gently mixed with water, so as to form a thin paste, and containing as few bubbles as possible, is then spread evenly over the wax partition or card, making the coating rather thick; for, if too thin, the piece should be made over entirely, the plaster seldom working well in superimposed layers.

The plaster, according to its quality, the weather, and the size of the piece made, will

require from five to twenty minutes to harden sufficiently. Then, taking a moulder's rip, or wood rasp, we chip off the unnecessary parts at once, avoiding at the same time the soaking of the surrounding cemented portions and the pressure the swelling of the plaster would make on its immediate surroundings. After having been set aside for 24 hours to dry, we resume the finishing work of the piece, using, according to its form, fine cutting blades, spoon beads, slickers, rifflers, or small curved files. Sand-paper of the finest grade (No. 00) is used to smooth up the surfaces.

What has been mentioned in the chapter on "Gum Shellac" should be remembered in time, in respect to the preference to be given to that substance for very small and more endangered parts that are to be provided for. To accomplish it, a small quantity of gum is softened above the lamp, and is given an approximate shape of the piece; then, heating the spot sufficiently, it is stuck on, cut with a sharp blade, and polished off with proper sand-paper.

Should any piece be wanting on a transparent or undecorated ornament, it is preferable to varnish the wire, or to use some made of brass or copper, owing to the oxidizing action of plaster on the iron; sometimes mere little pegs of lead, bone, or hard wood are deemed sufficient.

Being carefully dusted off, the plaster piece is coated with boiled linseed oil and allowed to dry during at least 24 hours; then the little cavities and defects noticed in the plaster, caused by either the air bubbles or bruised parts at the thinner edges, are remedied by means of the whiting filler; these little white spots also, when dried, are touched up with oil, and the piece, thoroughly dried, is submitted to a last touch with sand-paper. All is in ready condition now to receive the painting and decoration.

The portions added on ornaments of plaster, clay, terra-cotta, or alabaster, are not to be oiled, but merely soaked with a solution of borax, alum, gum acacia, glue, or gelatine, when these articles are to be shaded with water colors, unless the articles are intended to be or were originally covered with paints of oil or varnish composition.

XVIII.—Drilling and Riveting.

It is surprising to note the ignorance of the average "Works-of-Art Restorer" about the best practical ways to proceed in this very important operation. It seems to be no matter of his to know how to execute that work himself, or on his own responsibility; and the direct investigations to which we have devoted ourselves confirm us in the belief that, in general, he does not know how to do

it properly. It might be said that drilling on china or glass is somewhat difficult, very tiresome, not exempt from risks, and that if improperly equipped to do it, it is preferable to give it to responsible parties furnished with all the necessary implements. This appears to be a conclusive admonition, and the city repairer, fortunate enough to have a lapidist or glass-cutter within tolerable distance from his place of business, can sometimes get it done cheaper than he himself could do it. That we admit willingly; but no one is a genuine tradesman who does not know everything appertaining to his calling, and who is dependent upon certain processes practised by his neighbors, unknown to himself.

The time has gone by when the trade secrets benefit men, and we owe it to our attentive readers to give them an unrestricted description of a trade we have pledged ourselves to familiarize them with. Anyone who has visited the wonderful city of Paris could not help noticing the china mender, for he is one of the typical features that enliven that ever interesting capital. With a square box strapped on his back, brightly painted and ornamented, with its row of shiny tin fountain cocks (for he adds to the above calling the specialty of resetting spiggots), he walks about the streets, enters each house-yard, and causes the air to resound with his guttural and most compound yell,

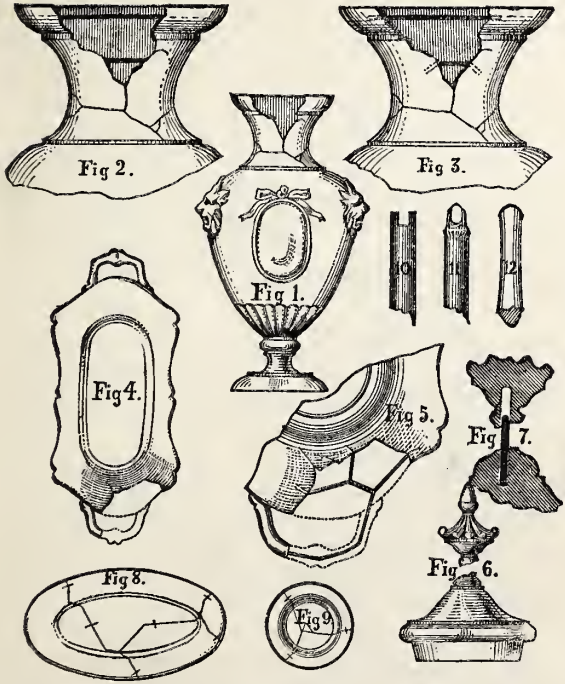


Fig. 1. Vase, showing the lost part.
Fig. 2. Wire frame fastened on the edges.
Fig. 3. Wire frame inserted in drilled holes.
Fig. 4. Platter, showing the lost part.
Fig. 5. Single frame for the whole piece.
Fig. 6. Cover to be fastened with inside pin.
Fig. 7. Cut showing the prepared holes.
Figs. 8, 9. Position of the rivets.
Figs. 10, 11, 12. Making the drill; its different stages.

This cut shows the safest wire appliances for holding china, either in the cabinet or against the wall.

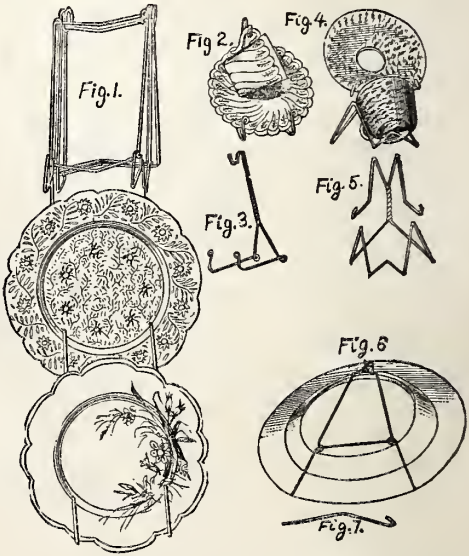


Fig. 1. Combination plate rack, made for any number.
Figs. 2, 4. Cups and saucers mounted on easels.
Figs. 3, 5. The easels alone.
Fig. 6. Plate mounted with hanger.
Fig. 7. Regulating top-hook for the hanger.

and one must be thankful if he does not accompany it with the more piercing noise produced by his small metal pipe. Such is the popular china mender. At the first chance of a job, he accepts it. Seated on his box in an alley-way, at a corner, in a yard, or sometimes on the street, one may see him handling the broken portions of a dish or the lid of a pitcher. He is a strong driller on hard material; be it earthen-ware, porcelain, or stone-ware, he attacks it with a mere bit of steel, short-handled, picked up somewhere from a discarded umbrella. Having ground his tool, so as to give it a three-cornered end, on the piece of sandstone he keeps by him, he dips it into a small pot containing a lump of camphor soaking in turpentine, and having marked the position of the rivet or clasp, just across the broken seam, he starts the boring of one hole. Using the full strength of his wrist, he whirls the tool right and left, steadily and quickly, giving quite frequently his tool a sharpening touch on the stone. We easily imagine the following operations. We have described his putty; the clasps or rivets are bits of wire doubled up and cut according to the depth and the distance between the holes, sharply bent at right angles at each end so as to pull together tight the parts to be joined. (Figs. 8, 9, p. 45.)

When on large and heavy ornamental pieces, it is of absolute necessity to have

recourse to riveting, as much as possible we insert the rivets. This is done by cutting a groove in the thick part of the material itself. The size of the rivet and the thickness of the wire indicate how deep and how long the cut is to be made. The groove being made amply wide enough, we drill the holes, place the clasps and fill up level, hiding by the painting as usual.

Of course there is a neater and safer way to drill pottery articles than that practised by our inferior fellow-craftsman, for the smallest of his tools would not match well with the minute pieces of china, in which we can bore holes with comparative ease and security, which process we are going to explain presently.

In general, one substance can scratch, bore, or cut another only when the latter is softer or has less cohesiveness in its particles, or when it is temporarily made softer by soaking, heating, etc. For instance, when drilling we should have the wood well dried; the bone, the alabaster, the marble wet with water; the brass or the lead covered with oil, and the iron aided with alkaline water. All and each of these can be worked easily with ordinary steel tools, for steel has more resisting power than any of these bodies. But in dealing with ceramic productions, which are mere agglomerations of extremely hard and insoluble substances or

clays maintained in shape by the admixture of other melted, or partially melted substances, the liquid employed only acts as an expelling agent of the bruised parts or dust produced by the tool crushing or dislodging the grain of the substance. According to the proportion of fusible bodies entering the paste, and also of the tenuity of grain or chemical properties of the clay, are obtained more or less friable substances; viz., clay, terra-cotta, earthen-ware, pate-tendre, porcelain, stone-ware; glass or enamel, compounds entirely fusible, belonging to a different class of manufacture.

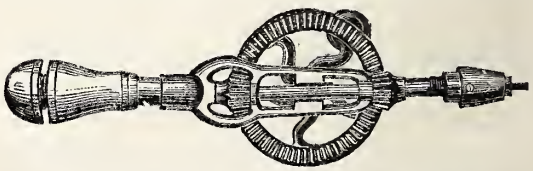
As a consequence of the above knowledge it follows that substances of the first kind are to be drilled with tools possessing sharp, incisive edges, while those belonging to the second require some endowed with all possible toughness, which execute their work more by pounding than cutting.

XIX.—A Powerful and Delicate Tool.

Therefore for the second class of bodies, throwing aside any steel instrument, we look for the hardest obtainable body, and its name comes to our lips—we call it the diamond. The newspapers have published extensive accounts of very formidable railroad enterprises. Everyone has heard of the compact beds of rocks, granite, etc., unyielding foes of the pick and maul of the miner, met with

under mountains to be tunnelled by the engineers. Such obstacles have vanished before the diamond and the dynamite. Small lumps of the precious stone set in the end of steel rods, acted upon by steam machinery, have drilled the holes and the explosive has accomplished its work. The difference between the work of drilling a mountain of rock or of the boring of wells, and that of drilling a thin piece of porcelain, is very little, the amount of time required and the size of the tool excepted; the main difficulty in the work is the same.

Our steam power will be a light and steady hand; our engine will be any drill holder, substantial but light, having a chuck



This very cheap and most handy tool, provided with a chuck, is manufactured by the Miller's Falls Manufacturing Company.

with a far-reaching shaft. Though a skilful artisan can perform good work with any sort of tool, we prefer those having cog-wheels to others requiring a bow or revolving by a spring, the steadiness of the hand and body being of absolute necessity when operating on brittle substances with narrow sur-

faces. Appliances acting by concussion are also very objectionable.

Ready-made diamond drills can be bought from any dealer in jewelers' tools, glaziers' diamond manufacturers, or sometimes from a lapidist; but as these delicate and costly tools get easily out of order, it is preferable to know how to prepare them one's self.

To make a drill, we take a straight piece of iron wire, two or three inches long, having a diameter somewhat larger than that of the hole wanted. Having obtained at the lapidist's chips of diamond of different sizes, pieces unfit for the wheel, whose cost is a mere trifle compared to that of the perfectly cut gem, we choose one of them, oblong, flat, presenting if possible two parallel surfaces, and being in length about the diameter of the hole desired. One end of the wire, held in a vise, is filed down flat; then, taking a metal saw, or better, a small knife file, we cut in its diameter a groove, wide and deep enough to admit the stone selected, lengthwise and with a pretty tight fit. We place the stone in the groove and force it in hard, interposing a piece of lead, copper, or hard wood, if we use the hammer. Taking the drill from the vise, with a pair of plyers we turn down on the stone the iron rising around it, and the tool is ready for the preparatory trial. Drills can also be made with several stones, provided they form a raise at

the centre of the tool. The drill is then affixed to the revolving motor, and having laid plumb on a table a piece of broken earthen-ware, terra-cotta, or sandstone, we try the drill on part of it, soaking freely with water. This operation, carefully managed, has only for its object the tearing off of the iron cap, to clear the salient angles of the stone, which alone play an active part in the perforation of the substance. As soon as this is effected, the little rings or burr that the wearing of the iron will leave below the stone are removed with a smooth file, taking care not to rub or dislodge the stone, proceeding with the filing down of the iron, from one-half inch up, according to the depth of the hole wanted. We hardly need to add that these delicate tools are to be well cared for, one not being always successful in the making of them.

A good precaution will be to have the drill passed through a small cork, or, by means of a little brass collar, fastenable on it with a screw, having the working part of the drill graduated so that, boring through thin pieces, the unfiled portion cannot force its way through and break the article.

If it were not for the explanations we have already given about the two different classes of materials that necessitate a special mode of drilling, it would seem strange that a tool not centred, that is, not having a determined

axle, and having no cutting edges either, could effect such remarkable results; but this is readily explained by the very absence of symmetry in its pointed portion. It effects a mere grinding of the substance; an action maintained to a limited space by the round frame of the tool itself. The more salient angles of the stone, freed by the particle it has just dislodged, by the pressure and the revolving motion of the tool, strike against another particle, which in its turn gives way, causing a succession of concussions unappreciable to the hand of the operator; the less salient asperities of the drill reduce these loose particles to powder, and the water—the best liquid to be employed—carries it out to the surface.

XX.—Colors, Varnishes and Brushes.

About fifteen different colors have proven sufficient to us to manage every case where painting is required. These are mostly mineral pigments, the same as ground in oil; but we buy them in their powder state, for those already mixed would not be proper on china, the oil darkening considerably in time. China colors cannot be made use of, owing to the necessary fusible salts added to them, under the name of fluxes; and aniline colors, on account of their fugacious nature, are not to be depended upon either. We insist especially on the fine quality of the

colors we buy; giving the preference to those possessing the richest hues; for earthy substances, grinding the steel of the palette knife, would be blackened when mixing on the sanded glass slab. It is only when large surfaces are to be painted that we mix them with the muller.

These colors are:

White of zinc, light chrome yellow, deep chrome yellow, brick red, burnt sienna, Chinese black, cobalt blue, ultramarine blue, Prussian blue, indigo, carmine lake, vermillion, verdigris, and the three chrome greens, —light, deep, and very deep.

Gold paints will be separately treated. (See Chapter XXIV.)

When repairing clays or terra-cotta, yellow ochre is required, and to match some kinds of bronzed plasters Paris green is sometimes absolutely necessary. For the majority of our restorations these colors are diluted in copal varnish, which should be of good consistency, and as colorless as can be procured. Good dealers in artists' materials keep the "Crystal" brand, which is almost of a transparent white. This varnish has not the inconvenience of drying too quickly; and is easily diluted with rectified spirits of turpentine. It is readily removed in case of spilling or other accident, and according to the proportion of turpentine added, the paint can be made to appear glossy, dull or pulverulent.

The pencils or brushes used by us, are of different sorts, according to the work required. To prepare the grounds we have the flat ones; to restore and accord the design, those in quills are good; for fine and continuous lines the writers or stripers are preferable; and, to effect the peculiar marbleing (tapé) found on modern pottery, quite worn out brushes are preferable to new ones.

For smooth surfaces, none but those of the best kind (finest spring) are to be used; even for clay coloring, the camel-hair brushes will be found preferable to those made of bristle, conveying the color more evenly over the rough surfaces.

The time spent in keeping the brushes in an absolute condition of cleanliness will repay amply in beauty in the work and in economy for the purse. It is materially impossible to obtain either good black or good white from one brush superficially cleansed, alternately used for the two; the second paint will incline to gray. A good precaution is to start with the lighter shades. To clean them we proceed thus: Having first rinsed them out in some turpentine contained in a little cup, they are once more freed from color by dipping them in pure varnish (or oil, if oil has been used), and rinsed out again in fresh turpentine once or twice, until the liquid remains colorless.

They are laid aside in a special box, and

to keep the moths from them we place a small lump of camphor in it. It will be of great assistance to apprentice-restorers, not well posted about color mixing, to have a set of soft pastels, which, by the gradation of the tints, educate the novice's eye; but, of course, the intermixing of the colors can only be acquired through close examination, good judgment and experience.

Pastel powders (soft) can sometimes be used instead of the mineral colors, restoring the previous shade, darkened by wetting with the varnish, by the addition of a little of some appropriate lighter powder, white of zinc, generally; but we mention this process as a last resort.

By the way, our readers should be warned against the "settling" of the colors; those mixed with lighter grades, the white especially, darkening from about one-twentieth to one-tenth in drying. It is preferable to keep above the given sample.

XXI.—Modes of Painting.

When one considers attentively the decoration laid on a piece of china or enamelled pottery, it can be observed that the colors employed possess generally very strong hues, but at the same time, that they are spread on in extremely thin layers, showing through their transparency the color of the ground on which the painting is done.

To the absence of the thorough understanding of physical laws in connection with the play of colors, more than to any other cause, ought to be assigned the failure that has accompanied the essays made by persevering and talented amateurs, engaged in the decoration of pieces of indigenous clay pottery, that were to acquire the appearance of the regular potter's make. In the permeability of these colors, allowing the light's rays to strike the under refractive surface of the clay, resides the secret of china colors being so bright, so attractive, so sparkling in their effect; a result that is surpassed only in enamel work on polished metals, and that cannot be acquired but by the overthrowing of the notions generally accepted and taught. Certainly, those of our lady readers who, on account of the little spare time left to them, or the fear of not succeeding in the work, will not attempt the more important restorations, will find quite a revelation in the reading of the above lines, and will be greatly benefited in one of their most delicate accomplishments—"home decorating."

Several ways are offered for patching the decoration. The first consists in concealing entirely the seams under a thick, broad and uniform coating of paint of the color of the ground; then, this being prepared and dry, go over the decorated parts, with appropriate colors, and draw anew the design

wherever it has been entirely hidden by the ground coating.

The second is to draw with the different colors fine lines, following exactly the seams, however they are situated.

The third, and the most difficult to practise, but the one that, in return, gives the best results, is to borrow from the original as little as possible, but more especially to take advantage of the general design and to make appropriate and harmonious additions to the decorations. As often and as much as this can be practically done, we give this process the preference.

Whatever amount of attention has been paid to the choice of the materials, however skilful and experienced has been the artist who has used the first process, it has been remarked that these restorations suffer serious climacteric changes; the paint, where the light grounds dominate, the white particularly, inclining toward the yellow tinge. And such changes seem to occur the more readily when the articles are exposed to undue influences of strong light, excessive heat, sulphurous gases, or even dampness.

The drawing of lines, properly executed, is not very noticeable on highly colored wares, but when done on light-shaded parts, it requires special care that the lines shall not assume an objectionable appearance.

A great deal of ingenuity is required in

concealing or blending in the decoration the seams, chipped or replaced parts, of a restored ornament. A sure hand, a refined taste, and a good knowledge of drawing, are of absolute necessity in most cases; but the preciseness in the matching of the colors compels anyone, *a priori*, to judge favorably of a job lacking some other very important quality.

In the background, in the faint colors particularly, are to be found the resources for the additions to be made by the ingenious painter; but sometimes a part of the decoration—an insect, a butterfly, a bird or plant—boldly placed on the front, will give a most happy result. In these additions, varying with each case to be treated, no proper directions can be given to assist the practitioner.

XXII.—Grounds—Different Whites.

The white grounds are of general occurrence, and at the same time the more difficult to execute properly, as great accuracy of appreciation is necessary for the mixing of these faint and delusive shades. The powders, ground with the least possible quantity of colorless copal varnish, diluted in spirits of turpentine, should not leave any grain, and hair particles or impurities are to be removed entirely from the slab. The proportions of the varnish must be such that no gloss will appear on the dried paint, though enough of

it is required to give the necessary body, without which it would not adhere to the glaze, but peel off within a short time.

What we have said already about the settling of the colors applies more forcibly to this case; for the lighter the shades are, the more readily detected will be the least changes that might take place. Always keep below the point, for darkening will certainly come quick enough. Only the fine flat brush can be made use of for this work. The paint is to be spread across the seam, in short, regular and parallel layers; and the impulsion given to the brush must be so managed that both ends of the touch be extremely light, leaving a greater amount of paint to the centre, immediately above the line to be covered up. Several coatings being always indispensable, it is necessary to allow each of them full time to dry before applying the following one. Six hours are amply sufficient to do this. Each subsequent coat must extend a little farther on each side of the seam, so that the work, when properly executed, will produce a layer of paint thick enough in the centre to entirely conceal the seam, while the edges will gradually fade out into the general tone of the ground. The bad condition of the joined parts, or the color of the cement employed, require sometimes as many as six or eight consecutive coatings before a satisfactory result is ob-

tained. The last one alone will contain the necessary quantity of copal to give the desired gloss—pure copal varnish, containing but a very little quantity of the light shade already applied, if operating on old faiences or soft porcelain enamelled. To remedy the sticking propensity of the varnish, a sojourn of several hours in a moderately warm oven will be given to the restored piece. This work requires from the artist many special qualities, among which is utmost cleanliness. To circumscribe it to narrow limits is considered a talent toward which are concentrated all the efforts of the ambitious restorer. Very unfortunately, its execution is of the greatest difficulty, and if we add to this the fear of changes the colors might assume in time, we hardly need to advise our readers to have recourse to it only when other processes are inapplicable. On colored parts, such work will be less difficult in its execution, and therefore much less objectionable. The following directions concerning the different white grounds, will likely be of great assistance to the beginner. In the case of modern china, which possesses ordinarily a blue tinge, a particle of indigo is to be added to the white; the pate-tendre, of a milky white, requires no blue, but a little ochre; and for the old Dresden, an addition of both Prussian blue and ochre is necessary. For Nankin or Canton wares, Prussian blue or

indigo, with a little ochre or deep chrome yellow, sometimes brick red, are to be added; and the peculiar cream-colored ground on Satzuma, Kioto, and modern wares, requires light chrome yellow and Prussian blue; but sometimes chrome orange, brick red or burnt sienna, are to be added, these hues varying greatly. Careful observers will note that by reserving special colors (the blue principally) for the gloss coating only, or last application of varnish, quite a different result can be obtained.

As for the thick, uniform and unctuous enamels, found on oriental, Italian, Spanish, Nevers, Nancy, old Dresden, Palissy and Moustiers specimens, this rich appearance can be imitated by a profuse use of the varnish employed, in which but a little of the proper light shade is mixed.

Should, on the contrary, the proportion of varnish employed have been too great, this can be remedied by rubbing the surface slightly with some prepared whiting wet with water, using the finger or a fine rag, and wiping off the deposit of powder with another piece of dry, soft muslin.

If we should give all the invaluable remarks a long experience has enabled us to make about the working and the mixing of paints, they would carry us far beyond the limits we have intended to give this book; therefore, we are going to add but a few

words, in reference to the color that comes next in importance to the white—the blue. The richest hues, known as Sevres blue, king's blue, and deep ultramarine, are imitated with ultramarine and carmine. When too rich, a little yellow ochre is added; if it inclines toward the violet, more carmine is wanted; and when pale or faded, a particle of white zinc is employed, keeping always enough varnish in the mixture to simulate well the enamel. For Chinese and Japanese blues, black is added; sometimes Prussian blue, ochre and white, are combined separately or altogether with the ultramarine.

XXIII.—Polishing Painted Surfaces.

In spite of all possible care exerted in the laying of the grounds, and owing to the strong body of the varnish lastly employed, the painted surfaces will look, though sufficiently glossy, rough, uneven, presenting a succession of undulations that will make the whole differ obviously from the adjacent smooth parts of the restored article. To correct this very objectionable appearance we have recourse to the levelling and polishing of the painting. A piece of flannel, dampened with water and sprinkled with finely powdered pumice stone or nitrate of baryta, is repeatedly passed over the painting, decreasing the amount of rubbing as the edges of the coating are neared. No soak-

ing is to be allowed, and no friction should be persevered in, unless the rag be sufficiently wet. When the surface is sufficiently leveled, another dry rag is used to remove all dampness and all of the scratching powder at the same time. The second operation is the polishing, which is done by an application of olive oil, pure, or assisted by some white insoluble powder, using cloth or flannel; finally, another dry rubbing with whiting or starch is necessary to remove the oily filth entirely. According to circumstances the levelling is done before the glossing, or before every successive coating with the glossless ground shade; the polishing applies to the varnish coat only.

XXIV.—Regilding—Metallic Reflection.

The patching of the metal decorated parts requires as much of our attention as every other branch of the painting. In general we apply the gold, silver, etc., last, for by proceeding otherwise, the consecutive and repeated handlings of the ornament would probably erase or at least tarnish such delicate work. It may be also added that the latter is much the less extensive part of the decorating process; though its intelligent application enhances considerably the appearance, and therefore the value, of the adorned article.

Not more than half a dozen different shades of gold are met with by the restorer; and amid this limited number are some that can be closely imitated by the intermixing of the others; metal inks, gold mixtures, and other secret compositions are entirely set aside by us, the green color of the vehicle being an evident proof that the bronzes have been already more or less oxidized by their immersion in the liquid.

Exception is made, however, of gold and silver on shells or cups, which are only finely divided metals in gum mucilage. If on hand they can be utilized and will answer very well whenever a proper surface is offered (not recently oil painted or varnished), and a dull appearance not objectionable; but we think these by far too expensive for a somewhat considerable job.

All the white metals are best obtained, like the silver itself, in powder; but, more fortunate than our ancestors, we are furnished by commerce with very good imitations of the more precious ore; so, when provided with the costly powder, or the leaves, we can limit its use to cases where the coarseness of the bronze powders would prevent the fine sparkling effect of the burnished metal. On potteries not enamelled and bisque figures, the bronzes will prove quite sufficient; and modern ornaments or Asiatic productions seldom require the use of the

expensive substance. In such cases, we prefer the powders mixed with copal varnish as indicated for all the other colors, and diluted with a maximum quantity of oil of turpentine, in order that the mixture shall produce no gloss, but possess only the adhesive power necessary for the uniform spreading of the metal; silver, or any other metal, is to be applied in the same manner.

But when the gold to be imitated has the bright appearance, the fine metal must be employed. Then the use of the brush is to be abandoned entirely; that is to say, as far as the spreading of the fine material is concerned. Two different methods can be adopted: 1. When the decoration is wanted on portions not recently oil painted or varnished, gold leaf work gives very good results, proceeding as follows: A very weak solution of gum water is used to design the requisite parts and afterwards allowed to dry; by simply breathing on the article, be it china, glass, ivory or metal, sufficient adhesive power will be produced for the gold leaf work, which, to be executed properly, requires special care. 2. The second process consists in preparing, or preferably buying, some of the composition known among paint dealers as gilder's mixture, or some japanner's gold size. The former is made of fat oil and ochre, to which a small proportion of dryer is added. Chrome yellow,

light or deep, brick red, etc., are also added to better correspond with the shade of the wanted gold; if for silver, white of zinc is employed. Brought up to paint consistency by a moderate quantity of spirits of turpentine, it is employed with a brush to draw the desired ornaments, and the mixture being allowed from 15 to 24 hours to dry, according to the proportion of siccatif entering into it, is ready for the application of the gold, silver or other metal, beaten in leaves as well as ground to powder. Practice only can tell when the mixture has acquired the proper degree of dryness for the best adherency of the metal upon it; it should be only clammy to the touch. The metallic leaves are laid on with cotton-wool or gilder's tips (wide long-haired brushes), and the powders are spread with a soft piece of cloth or chamois skin rolled up in the shape of a stump. Should not the gentle rubbing with the powder give the satisfactory brilliancy, the piece should be allowed to dry for a few days more, after which the agate or blood-stone burnisher, actively brought into use, will give the desired result.

XXV.—Biscuit—Parian Marble.

The restoration of biscuit or bisque differs very little from that of porcelain, and the numerous explanations given when treating of the different cements, make us confident

that very little trouble ought to be experienced in the choice of the process of repairing or of the cementing material to be adopted. However difficult it seems to be to conceal the line left after the use of the prepared shellac on a white surface, we persist in recommending that substance for the more exposed parts of the article, especially when they are relatively heavy and protruding considerably, as for instance, the extended arm of a figure. Sometimes, taking advantage of the cavities formed by the foldings of the dress or the surrounding raised work, the riveting can be effected and the clasps hidden entirely by bringing level over them the surfaces by means of the artificial plastic paste, or even adding new raised ornaments to conceal them. Plaster, clay, terra-cotta and earthen-ware, are easily grooved out to admit them; but the same work can be done on biscuit or harder substances only when provided with the emery wheel.

Painting on white surfaces is somewhat difficult to execute; the white paint (colored to correspond), made of varnish containing an excess of turpentine, can be used, provided the edges are well blended. Equal parts of white of zinc and whiting in very weak glue water, gum water, or milk, are also employed with good results. Several coatings being always necessary, the paint

should be very weak. Well regulated must be the quantity of it the brush is charged with; promptness and regularity in the application being the best elements of success. When dry, a final rubbing with the finest No. 00 sand-paper will restore the semi-polish of the grain.

XXVI.—Cloisonne and Enamel Work.

Cloisonnage is executed in many different ways. The metallic ribbon separating the differently colored enamels is sometimes fastened on the copper or brass sheets of which the article is made; and, at other times, is simply laid on potteries of hard or soft make. The difficulty in the restoration of these elaborate pieces, is particularly due to the presence of these little ribbons, which, owing to the ductile material of which they are made, do not break, but tear off, and carry away part of the loosened enamel. To reset the metallic bands is assuredly not practicable, and therefore the best way is to cut them off level to the surface with scissors or sharp wire-cutters. Being freed of obstacles to the good joining of the main parts, the article is cemented, shellacked, or fastened by additional pieces of metal, neatly soldered on, inside or outside, according to the case. Then, making use of the finest available flat-file, the little metal roughnesses are smoothed down even with the enamel, taking

care not to rub on it, for it would resist the action of the tool and quickly spoil it. With proper care, the use of fine sand-paper can be indulged in to insure a greater uniformity of surface.

The process of the making, approximatively followed, is alone susceptible of giving satisfaction; no recourse to the paint is necessary nor practicable in that case, as the differences of coloring between the different parts will be obtained by the varied shades given the paste that is to fill the cavities. This paste can be made of white or yellow wax, in which rosin (one-third) is dissolved and colored with a mixture of dry colors, producing at will the opacity or transparency of the sample, according to the quantity of white employed; the metallic lines are drawn with the bronze paint, spread with a very narrow brush. But such work can hardly stand any handling, and is to be executed only by persons that attend personally to their collections. A better result by far can be secured by giving the gum-whiting paste the desired color; in that case a little trial-piece should be composed of each separate color, which, being dried and waxed up to give the necessary lustre, will serve for comparison. The metal lines are to be imitated as directed above. More pains will insure a much better job, and the hard paste used will not only greatly strengthen the broken parts, but the colors

themselves will prove as perfectly lasting as those of any other part on the same article.

The repairing of enamel work requires good judgment and the most attentive care. The metal parts of gold, silver, or copper, having recovered their original shape by hammering, gentle pressure with a piece of hard wood or by the use of appropriate tools, are covered with the gum shellac, obtaining a good adhesion, and levelling with a heated blade. The imperfections are to be corrected with the gum-whiting paste, a fine brush moistened with water serving to round up the parts the knife would not work successfully. The consecutive operations are the same as those practised on porcelain or earthen-ware, the only difference consisting in a more profuse use of the varnish employed in the coloring. Sometimes, to set off the brilliant colors, or to better imitate precious gems, some sheets of gold foil (silver for the enamels of basse-taille) are laid under the transparent enamel. Then we have to use the same material ourselves, and we fasten it on the paste by means of a little dryer, before the application of the varnish colors. It should be remembered that prepared glue will answer very poorly to fasten loose pieces of enamel; for, the metal, having been somewhat bent out of shape, the particles fit but very imperfectly; we prefer the use of Canadian balsam, which by its perfect transparency insures entire satisfaction.

XXVII.—Bohemian or Venetian Glass. Cut Crystal

Many different processes can be used when broken pieces of glass are to be fastened together; the preference to be given depends entirely upon their size, form, weight. etc., and whether the article, being repaired, will be put in further use, and to what sort of influence it will be subjected. A cologne bottle, for instance, can be rendered as good as ever, if provided with all the pieces, procuring a perfect joint; for, strong alcohol forming the base of the perfume, we can safely use the ordinary glue cement, which is not affected by it; but, should this bottle be washed out with ordinary water, the glue would yield to the solving element of which it is itself made. On the contrary, an article that will be exposed to water, should be fastened with boiled linseed oil, Canadian balsam, copal varnish, shellac, or any other sticking substance not acted upon by water. Riveting, except for shellac, is necessary when the article is united with the above substances, and can be as easily effected on glass as on china or earthen-ware. It is recommended especially for articles of great weight which are apt to fall apart again as a consequence of the complete drying of the cementing material, or on account of the improper fitting obtained and unnoticed at the time of the joining together. When the particles

of glass are small, gum shellac is much preferable; but when the surfaces to be depended upon are very narrow, comparatively, to the strain the article is exposed to—as for example the stem of a vase, or the middle part of a stopper—a metallic pin (brass or iron) is inserted in the centre, to strengthen that weaker place. The hidden pin ought to be long enough to take hold from the thicker parts, and is not to exceed in size one-third of the diameter of the broken surface. The two holes for the pin must correspond very exactly; and the pieces to be bored out must be firmly held in a wood frame, by means of small wood wedges or screws, during the operation, which requires a great steadiness of hand, and we may add, is also not always exempt from risks. (See Figs. 6, 7, p. 45.)

XXVIII.—Metal Rings—Bronze Ornaments.

Should the slender part offer an even surface, the pin is advantageously replaced by a close-fitting ring, very thin, plain or ornamented, and wide enough to insure the necessary strength. These rings can be made to order by any jeweler; sometimes some can be found at the store of a dealer in smokers' goods which will answer the purpose very well. But why not at once tell how to make these rings? We seldom, in a long practice, have found an outsider understanding as well as

ourselves what we want exactly in these little matters, which cannot be of more importance to him than the small amount of money he can derive therefrom.

So, we cut a little band of paper, being in width the height of the proposed ring; we turn it round the stem to measure the length to be given the sheet of metal, allowing enough for the difference in thickness. Then, we cut out the metal, brass or German silver, with a pair of scissors or metal shears. We give it the round shape on a piece of iron rod, and we hold the edges close together by means of a very fine piece of wire. Having placed one or two small lumps of tin over the seam, inside the ring, we pass the whole over the spirit lamp, or use the blow-pipe until the soldering is effected. As the tin would not alone spread even and adhere to the brass, we are going to give the receipt for a liquid solder, which will bring the necessary assistance; we have found it answering equally well on iron, which makes us consider it as a precious acquisition. One drop applied on the tin will cause it to run immediately. Take of muriatic acid (hydrochloric) 12 fluid ounces; zinc 3 ounces; muriate of ammonia half an ounce; alcohol one ounce. Then put the zinc into a stout flask, gradually pour the acid upon it, and let it stand until the effervescence has ceased; then decant the clear liquid, dissolve the salt of ammonia and

add the alcohol. Having been led to speak about metal work, and having explained how to effect soldering on brass, we at the same time have removed the great obstacle to the repairing of metal mountings, that are often affixed to fine ornamental wares. Though the brazing would be more reliable, it is only applied when the metal can be easily separated (unscrewed) from the main piece, for fear the excessive heat required to melt the hard solder would endanger the adjacent pieces of pottery, thus saving time and avoiding the risk of taking apart. In making use of the blow-pipe, the practitioner should not allow the flame to be steadily directed on the brittle substance, as the heat projected on a single spot would crack the ornament, the neighboring parts not partaking of the necessary gradual expansion. Quite a number of separate bronze ornaments can be restored in the same way; but what has been said above does not apply, in the least, to bronze imitations, which are mere castings of lead or pewter containing zinc, bismuth, etc., and that very seldom stand a new application of heat.

XXIX.—Terra-Cotta and Clay Work.

Small articles made of terra-cotta, painted in oil-color, varnish, or any other liquid forming a gloss, are, as a rule, most easily repaired; a discreet amount of prepared glue

will generally answer the purpose; still better will be the mucilage made of gum tragacanth. When the parts are more exposed or have to stand more strain, the gum shellac should be preferred. Sometimes, considering the shape or the narrowness of the damaged parts, we insert inside the article wooden pegs or metal pins as has been explained about glass ware (Chap. XXVII.) We shall not speak further about the finishing or coloring part, already amply treated. Extra large pieces, such as garden-vases, statuary, must be relieved of all possible dampness before beginning the cementing operation. When properly dried they are joined with putty, gum arabic and plaster, or any other preferred cement—a number of them being given in Chap. XV.—and finally riveted together.

Repairing of terra-cotta not painted and that of baked clay are exactly alike. The clay ornaments, figurines, busts and groups, etc., that have been soiled by dust or greasy contact with the hands, should be (unless anterior repairs are suspected) entirely cleansed in potash water or hot suds and well rinsed off; being well dried, they are put together with the appropriate cement, and the cracks are filled up, the missing parts provided for, etc., except the oiling. The main difficulty consists in the coloring, which at first sight seems, on the contrary, the most easy part of the job. None but water-colors

can be successfully applied on clay; and, if not spread out with dexterity and uniformity, they will soak out the glue that has been employed to cement together, or will deform the filling work just completed.

If the piece is fastened with shellac, the water-color, not being absorbed by that gum, as it is by the clay, has a tendency to run, and leaves but a series of small drops of darker color. It is to remedy this difficulty that some have given suggestions for joining together with plaster, the pieces and their surroundings being previously well moistened with water. This might do well enough for one or two pieces occupying a well-framed space, but we think the plaster does not insure in every case enough of the necessary solidity to be generally recommended.

If the proportion of gum arabic or glue is too great, the color coating will shell off after a few days' drying, or will form a stain on the clay; and, if the quantity of powder is not sufficient, it will not cover enough; a moderate amount of each is to be employed. A great variety of shades are given to the clay; the one more often encountered can be imitated by using white of zinc and yellow ochre, each four parts, brick red two, and black one. Some Italian makes need only ochre and burnt umber.

The color mixture on the slab must be kept much above the sample, for it will

weaken considerably in drying. A little touch with it, given on some part of the base, will greatly assist toward the desired result. Two consecutive coatings are always necessary. For supplementary instructions, see Biscuit Coloring (Chap. XXV.)

XXX.—Repairing, Painting and Bronzing on Plaster.

The soft nature of plaster, and the want of adherence between its particles, render it a most indocile substance to cement with the gum shellac in its ordinary state. But its surface can be easily hardened by saturating with a solution of alum or borax applied with a brush; in this condition it will admit any sort of paint application. Attempting to clean it by rubbing with sand-paper or scraping tools would seriously damage it, for it would lay bare the little cavities or air-holes, contained in the plaster. Cleansing liquids being of no avail, we will indicate how to color the pieces. They can be given the appearance of clay by following the previously given directions, or be made to imitate bronze. Several processes can be selected from. We give the plainest one. The borax or alum coating being sufficiently dry, prepare a very weak solution of glue tinted to the desired shade; try on some hidden part of the base, and if satisfactory, paint the

article with it, avoiding the filling of all small cavities. A good shade can be obtained with Prussian blue, black, and yellow ochre. Give the first coating time to dry, and apply a second one. The salient parts are touched up with some bronze powder before the complete drying of the second coat, blending the edges; or, if already too dry, by breathing on it it will adhere sufficiently. Lastly, to give the burnished appearance, some wax encaustic is spread on and rubbed uniformly. Some artisans have carried so far the art of applying all sorts of painting on plaster or clays, that they imitate old wood carvings, ivories, dug-out medals or metal relics, oriental fire-arms, panoplies, rusted iron-mongery, old worm-eaten frames, etc., in fact, all sorts of old and rare objects, in the most deceiving manner.

Such perfect imitations, no doubt, are creditable to the marvellous talent displayed by the artists engaged in that occupation; but, we may add with a deep sense of satisfaction, that the sale of these pernicious plasters is as limited as that of the genuine and incomparably more costly articles. Very limited as yet is the number of customers found for these; and we hope, for the sake of decency and good taste, to hear that the filling up of houses with these base substitutions has been entirely abandoned.

XXXI.—Cleaning Delicate Ornaments.

Being strongly opposed to the use of any patent preparations, on account of the worthless imitations of the deserving article, we recommend not to use any secret polishing compound, except when bought direct from a responsible concern. The majority of these articles are injurious to fine work, being made of improperly sifted powders; some are found that contain salts of tin, mercury, copper or acids, pumice-stone, etc., whose action it is impossible to foretell. We have indicated how to deprive the common whiting of sand or other scratching particles (see Chap. XVI.) This powder is as servicable as any, and its action is only mechanical.

Working in a warm room, the gold or silver-plated bronze must be well deprived of any greasy substance, by scrubbing it with hot suds, as we would a piece of biscuit or Parian marble; any green spots are to be removed with vinegar or weak sulphuric acid. The piece is rinsed out in water (rain water preferably) and sprinkled all over with hot sawdust, to remove quickly all the dampness; it is then dusted off. Coating it all over with well diluted whiting, giving time for partial drying, all the work is gone over with a wide tooth brush, to remove the white powder entirely. On modern brass goods, highly polished and varnished, no water application should be allowed. A fine rag just damp is

all that can be used. Should they be decidedly altered, the best way is to hand them over to the manufacturer, who has all the appliances to unvarnish and revarnish them after having subjected them to another polishing.

Glass-wares.—The vulgar notion that everything is best cleansed by using hot scalding water, is to be entirely forgotten when cleaning refers to pieces of cut glass, or even thin pieces of either porcelain or earthen-ware. Quick transitions of heat and cold are to be carefully avoided; and even the use of lukewarm or tepid water on heavy glass is not less dangerous than that of boiling water itself.

Potash, soda, soap, cream of tartar, yolk of eggs, etc., are readily found in any household, and are amply sufficient to assist the cold water. Well rinsed out, the piece is laid aside to dry on a clean towel, without being wiped off.

Marble and Alabaster.—To take spots out of marble hearths or statuary, the following receipts can be tried: 1. Wash off every morning, with white soap and water, until the spot disappears. 2. Pearl ash, fuller's earth and whiting, equal parts; mix with alcohol to a paste and cover the spots. 3. A piece of chamois skin wet with chloroform or benzine, and renewed several times. 4. Equal parts of whiting and pumice-stone in powder, mixed with water and white soap brought to a froth.

5. Diluted sulphuric or muriatic acid, from five to twenty parts of water for one of acid; begin with the weakest solution and rinse out profusely with water, after the acid application.

Should any powder or acid have destroyed the polish, the parts are rubbed with white wax, well spread with a piece of cloth.

Wood, plaster, ivory, parchment, satin, etc.—1. Calcined magnesia, well dried, mixed with benzine to the consistency of a friable mass; cover the spot with the paste, and renew, if necessary. 2. Rub gently with the soft part of a clean piece of stale bread.

Badly soiled plasters.—See Chap. XXXII.

Gilding on wood.—No rubbing, but a very soft paint-brush dipped in rain water, passed over the soiled parts. To restore the brightness, the gilded parts are done over with yolk of egg, which is employed as an ordinary varnish.

XXXII.—A Help to the Memory.

[When a single date is used, it is that of the founding of the establishment.]

Alhambra Vase. Admirable specimen of Moorish pottery, found under the pavement of the castle of the Alhambra (Grenada, Spain). Supposed make of 1320; it is four feet three inches high, and is made of earthen-ware and decorated with a most complicated raised work, enamelled with two different shades of blue on a white ground, the whole heightened with gold and copper reflection. A copy of it was made in the Sevres factory in 1842. There were a pair of them found, but one got badly spoiled, of which a French lady secured some of the broken parts.

Antiquity of the Ceramic Art. According to Pliny the first pieces of porcelain seen in Rome were brought there from Pontus in Asia, by the army of Pompey, 64 years before Christ; but the Chinese were making it 1800 years before that; pottery is supposed to have been made in China 2690 B. C.

Anspach. Town of Saxony, Germany, producing imitations of Rouen earthen-wares. 1718.

Avignon (Vaucluse, France). Brown and yellow coarse potteries. 1500-1715.

Avon. Village near Fontainebleau, France, well known for its factories, making imitations of Palissy ware.

Awari. See Owari.

Awata. Name given to a Japanese pottery of fine quality with delicate crackled glaze of cream or velum color, decorated with painting in enamel colors, sometimes gold. Known as Shiba, Tokey, Kioto or Tokio.

Bayreuth. (Bavaria, Germany). Manufactory of earthen-ware and porcelain. 1740.

Banko or Manko. Japanese pottery of white or brown clay, very thin, unglazed; sometimes a fine black glaze is used, decorated with impressed patterns, also, with bold paintings in enamel colors, usually flowers.

Beauvais (Oise, France). Enamelled stone-ware; traced to the middle ages. 1395 to the present day.

Berlin (Germany). "Kaiser porzellan manufactur," specially devoted to hard porcelain. 1750 to the present day.

Bishu. Japanese porcelain with glaze of black enamel, decorated with gold. It is generally called "Lac ware."

Bordeaux (Gironde, France). Hard porcelain. 1714 to the present day.

Bottcher (Johann Friedrich), was an assistant in a Berlin apothecary's shop. To escape persecution, having been denounced as an alchemist, he fled to Saxony, his native country. August the Second, visiting Dresden at the time, having been told of the young man as having discovered the universal panacea, secured a private meeting with him; but, notwithstanding his denial, had him watched by another alchemist named Ehrenfried Walter von Tschirnhaus. The action of the fire on the crucibles employed by his companion, led Bottcher to compare them

with Chinese porcelain, and he spoke about it, but, for fear the remarks would attract outsiders' attention, the king assigned him the castle of Albrechtsburg at Messein, as a future residence. When Charles the Twelfth of Sweden conquered Saxony in 1706, King August sent, with a strong cavalry escort, Bottcher, Tschirnhaus and their three workmen assistants, to the fortress of Konigstein, where a laboratory was constructed for them. The following year they were brought back to Dresden, and there continued their experiments. Some knowledge of the processes and earths employed by the Chinese, having been transmitted to France by Francois Xavier d'Entrecolles, a resident in that barbarous country, helped considerably the progress in the new art. Tschirnhaus died in 1703, and Bottcher was given charge of the factory the king had just erected in Messein. Most unfortunately, he superintended the works but four years, dying in 1719, only reaching the thirty-seventh year of his age. The greatest secrecy was required of all connected with the manufactory. However, permits to visit the works were granted to Brongniart, the French chemist, at the instance of the all-powerful Napoleon the First, 1812.

Bourg-La-Reine (Seine, France). Hard porcelain. 1773.

Bow or Stratford-on-Bow (England). Soft porcelain. 1730.

Bristol (England). Hard porcelain, 1772; soft porcelain, 1774; earthen-ware, 1787.

Buen-Retiro (Spain). Celebrated porcelain factory of soft paste, situated in the palace of Charles the Third, in Madrid. 1759-1812.

Burslem (England). Important ceramic centre; soft porcelain and biscuit. 1770.

Capo-di-Monte (Italy). Earthen-ware and soft porcelain. 1736-1821.

Chantilly (Oise, France). Soft and hard porcelain, pipe clay. 1725-1817.

Chelsea (England). Old and important porcelain factory. 1730-1765.

Chinese Porcelain. Under the dynasty of Tsin, 265-419 A. D., the porcelain made at Tsong-ngeou was held in great esteem. In 583 the factories of King-te-tching, placed under

the patronage of the court, received considerable impulsion, these works being in activity for over eight hundred years. The prevailing color of the wares seem to have changed with each dynasty. The Tchin preferred the blue, 577-581; the Soui, the green, 581-618; the Thang, the pure white, 618-907. The emperor Tchin-Tsong gave his name to the sky-blue kind, the finest and the most esteemed amid the ancient makes, 954-1007. The antique porcelain is classified as follows: 1. The finest quality, the Tchai-yao or Tchai, manufactured in the province of Ho-nan, 954; the secrets of its fabrication were lost many years ago. 2. The You-tcheou, province of Kan-son, 960-1279. 3. The Kouan-yao, or magistrates' porcelain, 1107-1117. 4. The Ko-yao, or eldest brother's porcelain. 5. The Ting-yao, province of Pe tchi-li. The manufacture of the imitation of the old makes dating from the most remote epoch, the exact description of these different wares would be of very little practical value.

Choisy-le-Roi (France). Centre of manufactories of earthen-ware, soft and hard porcelain. 1785 to the present day.

Cologne (Germany). Enamelled stone-ware. 1550.

Copeland. Name of a ceramist. See Stoke-on-Trent.

Delft (Holland). Important centre of fabrication of earthen-ware. 1310 to the present day.

Derby or Derby-Chelsea (England). Porcelain works, soft paste. 1750-1770.

Dresden (Germany). City possessing the oldest collection of Chinese and Japanese wares; also a full collection of the porcelain productions, showing step by step the progress that important industry has made since the date of its discovery.

Ewer (Aiguiere, in French). High pitcher on a foot.

Fænza (Italy). One of the oldest factories of the kingdom; supposed origin, 1480. From that name is derived the French word, faience, meaning earthen-ware.

Frankenthal (Bavaria). Hard porcelain. 1754-1760.

Fulda (Germany). Centre of porcelain manufacture, started by the Prince-Bishop of that town, in his own palace. 1763-1780.

Fulham (England). Renowned for its soft porcelain figur s and marbled table-ware, in imitation of the Chinese. 1684.

Furstemberg (Germany). Hard porcelain factory, under the protection of Charles, Duke of Brunswick. 1750.

Gien (Loiret, France). Important manufactory of earthen-ware; imitations of all ancient makes.

Gotha (Germany). Manufactory of hard porcelain. 1781.

Henri the Second. See Oiron, France.

Heshu or Hezen. Japanese porcelain of fine quality, and egg-shell ware, decorated with color; also blue, in imitation of Nankin, or ornamented with flowers modelled in slight relief.

Hiradoson. Japanese porcelain; egg-shell ware of the finest quality, decorated with blue and colors.

Hochst on Mein (Germany). Important factories of earthen-ware and porcelain, under the protection of the Archbishop of Mentz. 1740.

Imari. Japanese porcelain, colors in the enamel; leaves and flowers on white ground.

Ile Saint-Denis (France). Hard porcelain. 1778.

Kaga or Kutani. Japanese pottery and heavy porcelain, usually decorated with elaborate paintings in red and gold; sometimes blue or green is introduced. Kutani is the name of the place where the factories of the Prince of Kaga are situated.

Keltersbach (Germany). Hard porcelain. 1756.

Kio-Tzing. Name given by the Chinese to a curious kind of porcelain. The article is made of two layers of porcelain paste; the outer shape being procured by the ordinary process, the decoration is done inside, covered with another sheet of porcelain and enamelled, so as to conceal the decoration. Then the outside first covering is eaten off by the wheel as close to the decoration as possible, and finally enamelled so as to obliterate almost entirely the colors. It is only when the articles are filled up with liquid that the decoration appears plainly; but, so much time and care are to be bestowed upon the making of the Kio-tzing, that the art is seldom practised.

King-te-Ching. Great centre of ceramic manufacture. The number of factories established in that Chinese place is estimated to be five hundred, and give employment to more than one hundred thousand artisans.

Kioto or Kiyoto. Name for Japanese-ware. According to the finish of the work, it is sometimes called Awata or Satzuma.

Korzec (Poland). Manufactory of hard porcelain. 1803.

Kutahia (Turkey). Ancient earthen-ware factory. XIVth to XIXth century.

Kutani. See Kaga.

Ku-Tong. Name given by the Chinese to the imitations of antique potteries.

Lambeth (England). Earthen-ware industry. Imported by the Dutch; fine tiles. 1640-1646.

Lille (Nord, France). Centre of manufactories. Earthen-ware, 1696; soft porcelain, 1711; hard porcelain, 1784.

Limbach (Germany). Hard porcelain. 1760.

Limoges (France). Porcelain factories. 1773.

Lisieux (France). Earthen table-ware. 1650.

Liverpool (England). Ceramic centre for earthen-ware and soft porcelain. 1670.

Locre (Paris, France). Hard earthen-ware factory, known under the name of "La Courtille." 1773.

Lodi (Italy). Earthen-ware. 1764.

Longport (England). Ancient porcelain. 1793.

Longwy (Mozelle, France). Important earthen-ware factory; pipe clay; a specialty, called rock-work. Fancy Japanese cloisonne decoration.

Louisburg (Germany). Earthen-ware. 1725.

Lucca-della-Robbia. Family name of the famous Italian sculptors who first applied enamel to clay. 1438.

Luneville (Meurthe, France). Important ceramic manufactories, 1731; products sometimes called "Terre de Lorraine." Also, hard porcelain. 1769.

Luxemburg (Holland). Earthen-ware. 1767.

Lyon (Rhone, France). Birth-place of the earthen-ware industry; introduced into that city by Jean Francisque, of Pesaro, Italy, 1536.

Majolica. A kind of coarse pottery made on the Island of Majorca, Spain, where the Saracens had established a factory. Transplanted into Sicily, the new industry received the greatest impulse under Lucca-della-Robbia from 1400 to 1481, who left many specimens demonstrating amply the superiority of his knowledge in that sort of manufacture. This pottery is first made of red

earth, then covered with a layer of white clay, decorated and varnished with a lead enamel.

Majorca (Spanish Islands). Manufactory of varnished clays with metallic reflections, traced as far as the VIIIth century.

Malaga (Portugal). Same production as above. XIIIth century.

Manko. See Banko.

Manissez (Spain). Ancient factory. Earthen-ware with metallic reflection. XVth century.

Manual of pottery and porcelain marks. A favorite book for the ceramic amateur, by W. H. Hooper and W. C. Phillips, London.

Marieberg (Sweden). Earthen-ware; porcelain. 1750.

Marseilles (France). Important ceramic factory; earthen-ware, 1697; hard porcelain, 1766.

Meissen (Saxony). The first place where hard porcelain has been manufactured in Europe (1709); factory flourished most from 1731 to 1756, under the auspices of August the Second, King under the name of August the Third. After the Seven Years' war, Frederick the Great pillaged the factory, secured and conveyed to his factory at Berlin the finest pieces and models, not forgetting the artists themselves. In 1759, during the war between Prussia and Austria, that site having been transformed into a battle-field, the works, including all the records, were again destroyed.

Metched (Persia). Manufactory of earthen-ware.

Minton. See Stoke-upon-Trent.

Modena (Italy). Ceramic centre; renowned for its great painters.

Monte-Lupo (Italy). Brown varnished clay, decorated in relief work. XVIIth century.

Montpellier (Herault, France). Earthen-ware. 1755.

Moscow (Russia). Hard porcelain. 1784.

Murrhins. Name given to vases made famous by their antiquity. At first considered as Chinese porcelain; they proved to be carved out of a transparent stone.

Nancy (Meurthe, France). Earthen-ware factory; also biscuit groups, statuary. 1774 to present day.

Nankin (China). Very ancient manufactories of hard porcelain.

Naples or Capo-di-Monte (Italy). Finely decorated

earthen-ware, XVIth century; soft porcelain, 1736-1821; under the protection of Charles the Second.

Nevers (Nievre, France). Earthen-ware, 1565; imitation of antique wares.

Niederwiller (France). Old ceramic factories; earthenware, 1754; biscuit and hard porcelain, 1794.

Nuremberg (Germany). Manufactory of enamelled clay; lead enamel, 1300; tin enamel, 1400; soft porcelain, 1712.

Oiron (Deux-Sevres, France). Remarkable earthenware products, erroneously termed Henri the Second.

Orleans (Loiret, France). Hard and soft porcelain; some pieces were painted by Le Brun. 1668-1808.

Ota. Yellow pottery, resembling Satzuma, dotted with black; flesh-colored heads, encircled with gold.

Owari or Awary. Japanese porcelain, decorated in blue, colors and gold; heavy gloss of celadon enamel; delicate coloring.

Padrone (Italy). Earthen-ware, 1500 to the XVIIth century.

Palissy (Bernard de). Born in Agen, France, in 1510. Apprenticed at glass-making and glass-painting by trade, he devoted himself specially to the perfecting of the enamelling art, experimenting for sixteen years, until the most satisfactory results were obtained. He wrote a most thrilling history of his labors, sacrifices and sufferings during the progress of his researches. His perseverance was at last rewarded, and fame, honors and independence were bestowed upon him. But such a noble and energetic temper could not submit to fanatical religious persecution, and he emphatically manifested before Henri the Third his determination to die in Protestantism. Imprisoned in the Bastille, he ended his busy and useful career in his ninetieth year. Ceramist at Saintes, 1535.

Paris (France). The manufactory of potteries in that city is said to have been contemporary with its occupation by the Romans. During the XIIth and XIVth centuries, unvarnished articles of baked earth were made. Within the XIIIth, enamelled pottery was started, and earthenware was first made in 1664. Ancient porcelain makes were classified according to the seat of the factories: Faubourg St. Denis (Count of Artois protection); Fau-

bourg St. Antoine (Morelle, director); La Courtille (Locre, director); Rue Thiroux, surnamed "Porcelaine a la Reine;" Rue de Bondy (Duke of Angouleme protection); Pont-aux-Choux (Duke of Orleans protection); Barriere de Reuilly (Chanon, director); Rue de Crussol (Potter, director); Fabrique du Petit Carousel.

Pavia (Italy). Manufactory of brown earthen-ware. 1690.

Persia. Ceramic centre for earthen-ware and soft porcelain; industry imported from the Chinese.

Pesaro (Italy). Earthen-ware, pearl reflection. 1500.

Petersburg (Russia). Important hard porcelain factory, 1744; Imperial manufactory under the reign of Paul the First. 1796-1801.

Pirkenhammer (Austria). Also termed Carlsbad; the most important of the Austrian porcelain factories; founded in 1802 by two artisans from Saxony, and bought from them by Christian Fisher, of Erfurt, 1818; it was so successfully managed that it is ranked at the head of Austria's manufactories.

Pise (Italy). Earthen-ware. XVth century.

Plymouth (England). Factory started by Cookworthy; first production of hard porcelain in England. 1760.

Popoff. Ceramist at Moscow, Russia.

Porcelain. Artificial substance produced by the mixture of a special sand called feldspath, with an infusible white clay, called silicate of alumina or kaolin. The difference between the hard and soft porcelain consists in the proportion of the two above ingredients; the hard porcelain containing more of the fusible material, requires a greater heat for its baking, say 4000° Fahrenheit, or about that of silver melting, maintained for about forty hours. Some makers add to the above substances soapstone, bone, sparry gypsum, or flint, calcined and ground, and sometimes imperfect white pieces of china broken and reduced to powder. Stone-ware is made of clay and flint; its body is still more dense and compact, and the glaze that covers it is not absolutely necessary. Reaumur, in his experiments, tried to harden the glass and to give it some opacity; while Bottcher succeeded in rendering the stone-ware more fusible and more transparent. Both were theoretically correct. See Soft Porcelain.

Porcelain Tower. Building of octagonal shape, erected at Nan-king. It is nine stories high, or about 330 feet; its entire surface is covered with porcelain tiles of five different colors. Although erected more than 400 years ago, it has withstood all the alternations of seasons and every variety of weather, without exhibiting the smallest symptom of deterioration. Finished in 1431, it took nineteen years to build it; its cost amounted to $3,750,000. Destroyed in the insurrection of 1862.

Portland or Barberine vase. Specimen of antique glass work that ornamented the Barberine palace for two hundred years. Subsequently bought by the Duchess of Portland, it is generally known as the Portland vase. It was found about the middle of the sixteenth century, in the tomb of Alexander Severus, who died in the year 235. The body of this vase, at first supposed to be of porcelain, is made of deep blue glass, ornamented with white opaque figurines, which are designed and sculptured in the style of cameos with a degree of skill truly admirable. Wedgwood paid four hundred pounds for the modeling of one copy. He executed fifty pieces, for each of which he obtained but fifty pounds, a price insufficient to cover his expenses.

Rauenstein (Germany). Hard porcelain. 1760.

Ravena (Italy). Earthen-ware. XVth century.

Rhodes (Asia-Minor). Earthen-ware; sometimes called Persian. XVIIIth century.

Rimini (near Ancone, Italy). Earthen-ware. 1535.

Rochelle, la (France). Earthen-ware manufactory in operation from 1705 to 1735; started afresh, 1743.

Rockingham (England). Earthen-ware, 1757; porcelain, 1807.

Rouen (France). Very ancient centre of earthen-ware productions; floor tiles, 1542; importation of the industry by workmen from Holland, Nevers, and Italy, 1641; soft porcelain, 1647.

Rudolstadt (Thuringia). Hard porcelain. 1758.

Sagonte (Murviedro). Famous antique potteries.

Saint-Cloud (France). Centre of manufactories; earthen-ware, 1688; knowledge of soft porcelain imported from Saxony, 1702.

Samian-ware. English antiquarians give that name

to an ancient kind of fine Roman pottery of a brilliant red, comparable to the remarkable article made at Samos, Greece, 900 B. C.

Sarreguemines (Mozelle, France). Fine earthenware factory. 1769 to present day.

Satzuma. Very ancient pottery. Remarkable for the elaborateness and the finish of the decoration. The modern Kioto is an imitation of its wares.

Savone (Italy). Earthen-ware. XVIIth century.

Saxony (Germany). See Bottcher, Dresden, Messein.

Sceaux (Seine, France). Fine earthen-ware, 1747; soft porcelain, 1750.

Seville (Spain). Fine earthen-ware or soft porcelain, 1768; hard porcelain, 1770; also pipe clay.

Sevres (France). See Vincennes. The constant increase of the demand for the porcelain manufactured at Vincennes necessitated removal to a better location, and in 1754 the erection of the present large factory was begun, the construction having required two years. The two sorts of porcelain were manufactured till 1804. Louis the Fifteenth having, in 1760, bought the rights of the Vincennes proprietors, gave a great impulse to the new works, and Madame de Pompadour having declared herself the protectress of the ceramic art, the supremacy of the royal factory was soon recognized through the whole of Europe. A royal ordinance, published in 1766 and renewed in 1784, forbade all other manufacturers to use any gold in the decoration of their wares, with the exception of the privileged factory. After the war of 1814, all the stock found at Sevres being abandoned to auction sale, unprincipled parties bought great quantities of the pieces, and by the application of chemicals were able to remove the enamel and decoration; then, ornamenting the pieces again, according to the oldest patterns, and selling them as ancient makes, scandalously acquired fortunes. To detect these frauds necessitates special study and an accurate knowledge of the shapes corresponding to the different epochs. The finest collections of Sevres-ware are to be found in England; that possessed by the queen, in Buckingham palace, bought by George the Fourth during the revolutionary events, exceeding by far all the others.

Shelton (England). Manufactory of brown and white

stone-ware, started by Thomas Miles, 1685; red and white stone-ware, 1743; Wedgwood imitations, 1770.

Shiba. See Awata.

Shinsha. Cream-colored porcelain, fancy shapes, imitations from nature, dark green enamel, pieces soiled with brown mud.

Soft Porcelain. Invented in 1695. This sort of porcelain can support, without softening, a greater heat than suffices to melt glass. It is semi-transparent, has a vitreous fracture, and returns a clear sound when struck with a hard body. Harder but not so brittle as glass, it bears without injury sudden and considerable changes of temperature. Can be scratched with a steel blade. Extensively manufactured at Sevres, the making of it was abandoned, the proportion of arsenic entering its composition having proved hurtful to the workmen employed.

Spode. Ceramist at Stoke-on-Trent, England, 1784.

Staffordshire (England). The potter's art in that country is supposed to date from its invasion by Romans; Burslem was the first noted centre of manufacture, 1686; made famous by the discoveries of Wedgwood, six different specimens of pottery being brought to notice between 1760 and 1762.

Stockholm (Sweden). Earthen-ware. 1770.

Stoke-upon-Trent (England). Ceramic centre celebrated for its great potters: Spode, 1784; Minton, 1791; Minton's son, 1837, fine earthen-ware; also Copeland's Parian marble.

Strasburg (France). Manufacture of clay pipes, 1709; earthen-ware goods, 1721.

Swinton (England). Earthen-ware and porcelain factory erected by the Marquis of Rockingham, 1757. Bought by Malpass in 1765, and sold to Thomas Bingley, 1807.

Talavera-de-la-Rena (Spain). Enamelled potteries, XVIth century.

Three Porcelain Bottles. Trade-mark of a large Delft pottery factory, founded by Jacobus Pynacker, 1672.

Three Bells. Trade-mark of another Delft manufactory, started by the widow Simon de Mesch, 1671.

Tokey or Tokio. See Awata.

Tournay (Belgium). Earthen-ware, 1650; soft porcelain, 1751.

Tsou-Tchi. Japanese porcelain.

Urbin or Urbania (Italy). Name given by the pope Urban VIII. to the town of Castel-Durante. Earthenware and majolica. XVIIth century.

Urbino (Italy). Earthen pottery, 1482.

Valence (Spain). Earthen pottery with metallic reflection, 1528.

Valenciennes (Nord, France). Earthen-ware, 1735; soft and hard porcelain, 1785.

Venice (Italy). Earthen-ware, 1535; soft and hard porcelain, 1740–1812.

Vienna (Austria). Porcelain factory, founded by a refugee from Meissen, 1720; under the protection of Marie-Theresa and Joseph the Second. An imperial porcelain manufactory, specially devoted to purely artistic goods.

Vincennes (Seine, France). In 1735 a fugitive workman, transmitted from St. Cloud, a place where some common productions were already made in 1695, to Chantilly, the art of making soft porcelain. About the year 1730, Macquer, following the instructions of Reaumur, first produced the fine porcelain to which Sevres owes its great renown; a singular circumstance having led to the discovery at St. Yriex, a village near Limoges, of the earth corresponding to the pe-tun-tse and Kaolin of the Chinese. In 1740, the Dubois brothers were charged by the government to erect a special laboratory in the works, but their incompetency and misconduct caused their dismissal, and Gravand took their place. In 1745, Charles Adam, a noted sculptor, obtained a monopoly for thirty years, and having secured as assistants, the best chemists, artists and painters, progressed rapidly in the manufacture. See Sevres.

Vista-Alegre (Portugal). Hard porcelain. XVIth century.

Wallendorf (Saxony). Hard and soft porcelain. 1762.

Wedgwood (Josiah). One of the greatest English ceramists. From a very low path in life, and without education, he elevated himself to the highest rank of science, merit, honor and integrity. While at Burslem, England, he invented the china specialty bearing his name; also the special cream-colored article called queen's-ware.

He visited the once celebrated factory of Messein in 1790, and confident that it could be restored to its previous activity, offered to pay yearly 3000 pounds sterling for the privilege of running it himself; but his offer was refused. He created in England one of the most prosperous ceramic establishments. Born in Burslem, Staffordshire, 1730, he died at the age of sixty-five.

Worcester (England). This well known factory was founded in 1751 by Doctor Wall, the inventor of the printing process of decoration. The first articles made were white and blue, in imitation of the Nankin wares; but soon after, the Japanese, Dresden, and Sevres makes were copied; also Limoges enamel imitations.

Yarmouth (England). Ancient ceramic manufactory; also Wedgwood imitations.

Zurich (Switzerland). The making of earthen-ware in that country is traced to the XVIIth century. The making of hard porcelain dates from 1760.

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